ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

NOVEMBER 1957

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FOUNDED 1866

A STRONG U.S. LEAD-ZINC INDUSTRY: Andrew Fletcher cites the need 86

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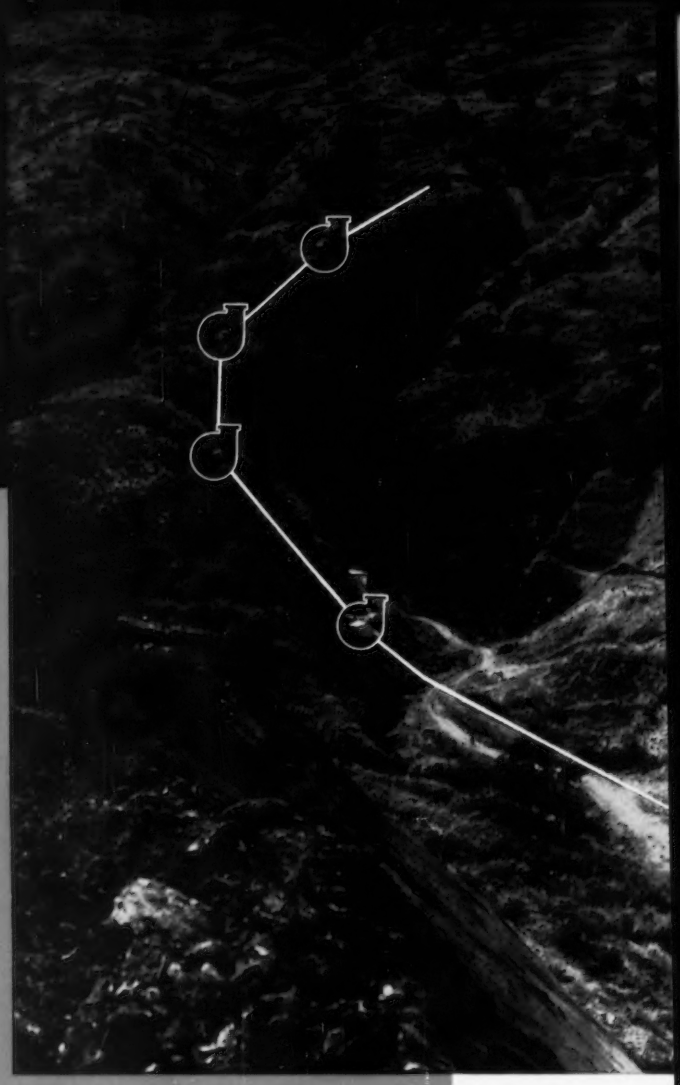
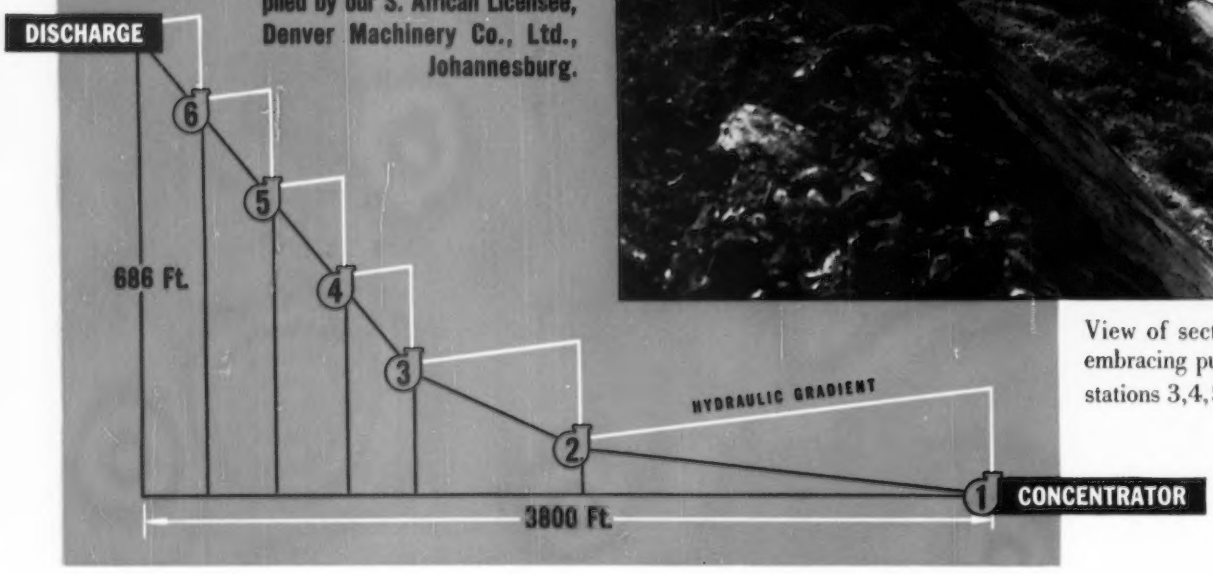
Tough pumping job in rugged UGANDA British East Africa



View of section embracing pump stations 3,4,5,6.

KILEMBE MINES Limited is efficiently pumping minus-48-mesh tailings from its copper-cobalt concentrator up 686 ft. for back-fill of mined stopes. Using B-frame Hydroseal pumps in series in six stations, this unique automatic system was designed by A-S-H engineers at Wynnewood, Pa., and the pumps were supplied by our S. African Licensee, Denver Machinery Co., Ltd., Johannesburg.



30 Tons per Hr. (25% solids)
400 U.S. GPM
Total Dynamic Head—840 Ft.
Static Head—686 Ft.
3800 Ft. Std. 5-inch pipe

Our varied installation experience throughout the world, and our continued interest in the performance of our pumps are factors of benefit when unusual problems arise. May we help you?

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Representatives throughout the World

HYDROSEAL and CENTRISEAL
SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

It's not just a bit of <u>metal</u> you're buying...

it's

FEET OF HOLE!

That's why it *pays* to make sure it's a

CARSET JACKBIT

Let's face it — most carbide-insert rock bits look pretty much alike. But put a bit on a rod and drive it deep in solid rock and you'll find that they don't all behave in exactly the same manner. This all-important difference can be measured in only one way — and that's *feet of hole*. The bit that gives you maximum footage per dollar of bit cost is the one you want on your job.

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ENGINEERING AND MINING JOURNAL

91st YEAR OF PUBLICATION

NOVEMBER 1957

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B.F.Goodrich report:

One belt does the work of 3 on high lift, long distance hauls

Oldest steel cord belt on Iron Range now in its 10th season

Problem: It's over a third of a mile and a 340-foot lift from the bottom of that iron ore mine up to railroad cars. Getting ore out of a deep pit like this used to take a series of three or more conveyor belts. No one belt could be strong enough for the job without being so heavy and stiff it would be impractical.

What was done: B.F.Goodrich engineers went to work on the problem, and developed steel cord construction. In this exclusive conveyor belt design, individual steel cords run lengthwise, each completely surrounded by rubber. These parallel cords give tremendous strength, yet are flexible so that troughing is natural, belt keeps centered on idlers, spillage is held to a minimum.

Savings: With steel cord construction, one conveyor belt now does the job of three or four belts on high lift, long distance installations. Money is saved, maintenance reduced, because the steel cord belt eliminates the transfer points necessary with a conveyor system built in several stages with ordinary belts.

Extra benefits: The B.F.Goodrich steel cord belt installed here has been at work 10 seasons now, hauling 1000 tons of ore an hour up and out of the pit. It has lasted longer than any conveyor belt ever made with steel cords or cables.

Where to buy: Your B.F.Goodrich distributor has exact specifications for the B.F.Goodrich belt described here. And, as a factory-trained specialist in rubber products, he *can* answer your questions about *all* the rubber products B. F. Goodrich makes for industry. *B.F.Goodrich Industrial Products Co., Dept. M-155, Akron 18, Ohio.*

B.F.Goodrich

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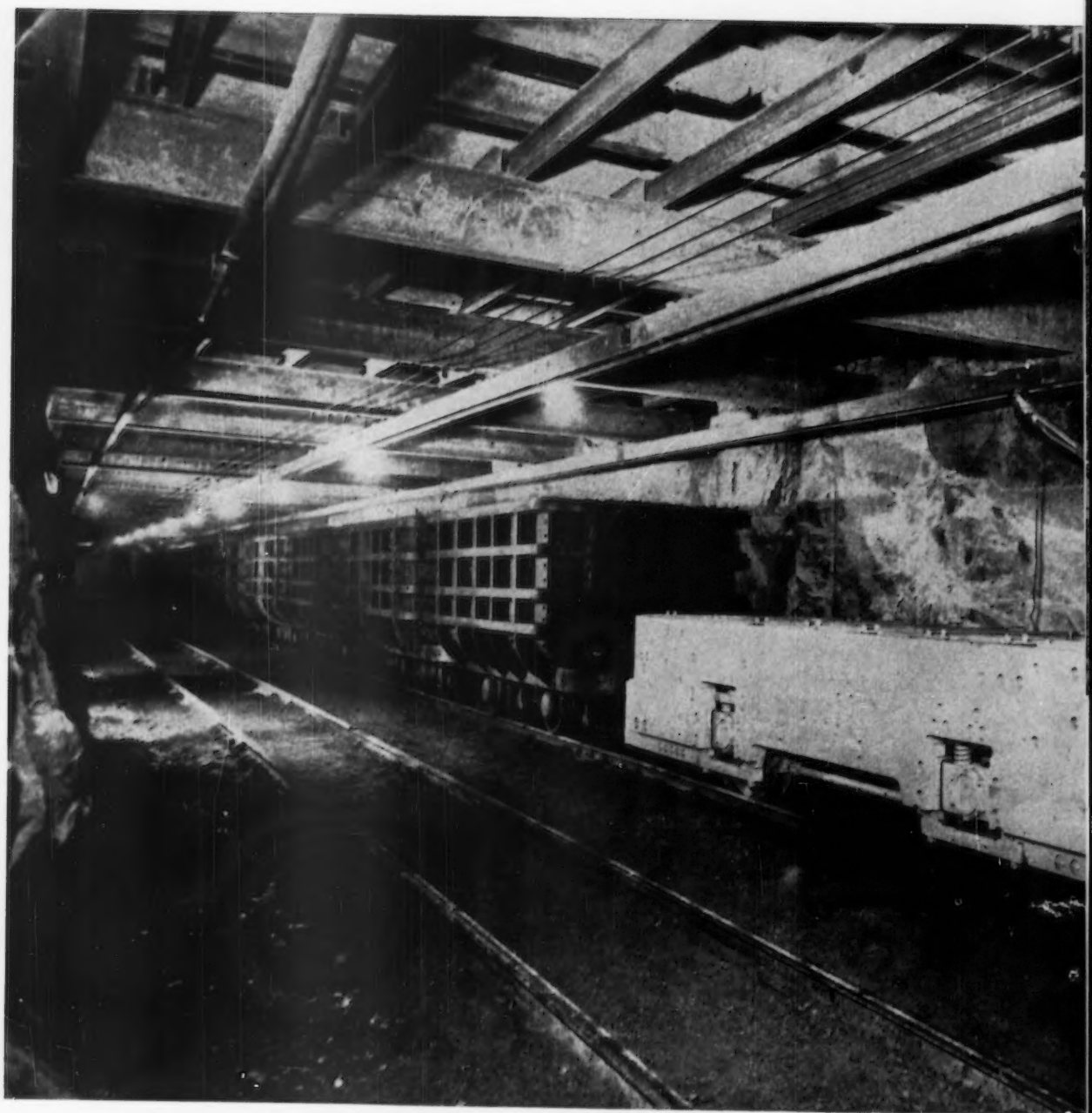
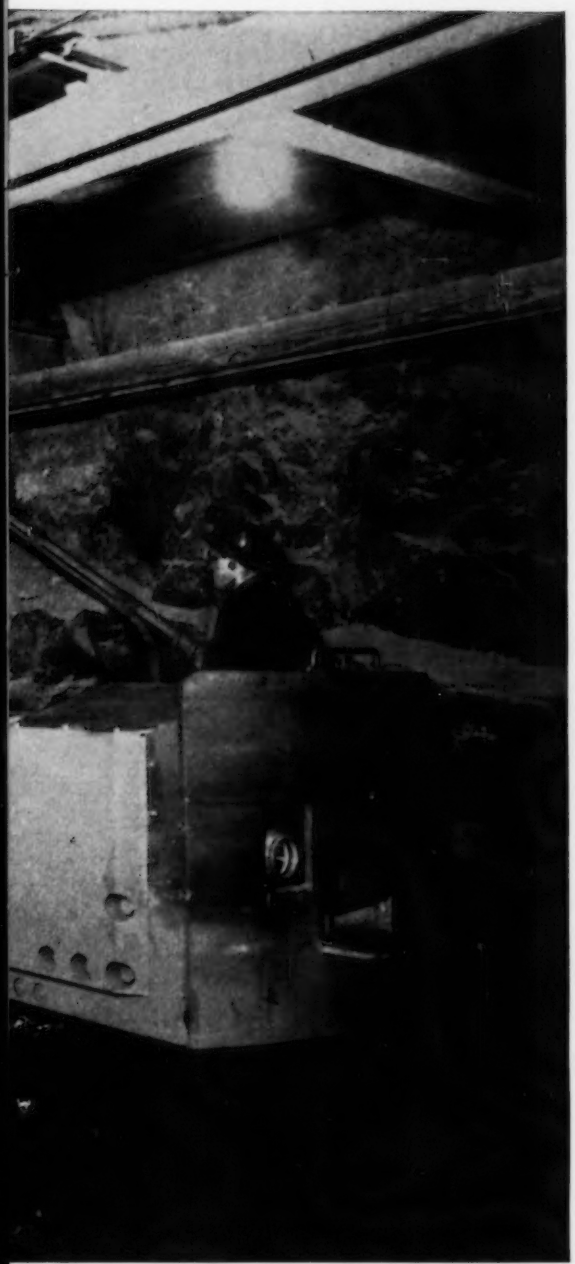
EASIER STARTS and



TEXACO

TEXACO

GREATER SAVINGS



Even at winter temperatures, trains start more easily when car wheels are lubricated with

Texaco Olympian Grease.

Maintenance costs are lower, too.

TEXACO OLYMPIAN GREASE—equally effective in plain, cavity hub or anti-friction bearings—has high resistance to oxidation, does not separate in service or in storage, and *stays in* the bearings. You can count on long lasting protection, long life for bearings.

For your wire rope and open gears, use *Texaco Crater* or (for spray application) *Texaco Crater X Fluid*. It protects both strands and core, keeps wire rope strong longer. It cushions shocks and permits heavy loads, prolongs open gear life.

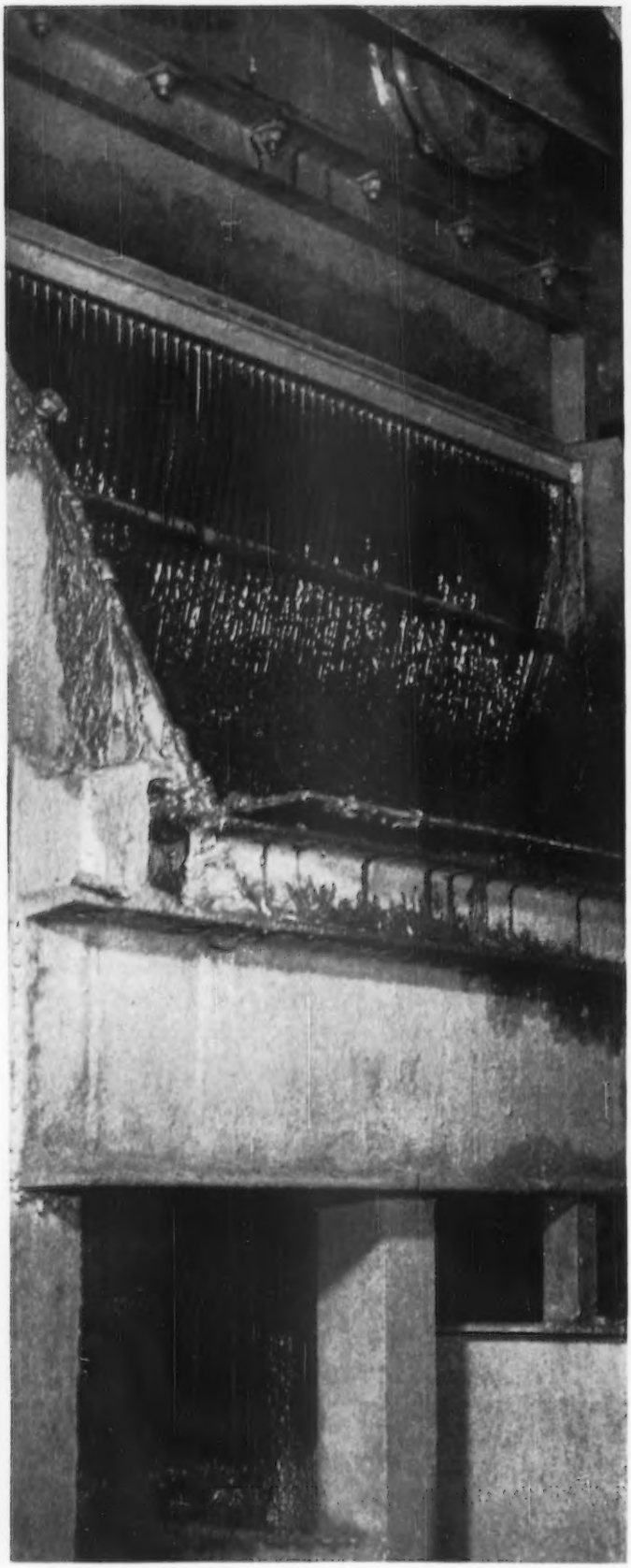
Let a Texaco Lubrication Engineer give you the benefit of his broad experience in the selection of the proper lubricants for your equipment. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

FOR OVER 20 YEARS, MORE COPPER ORE HAS BEEN MINED IN THE U.S. WITH TEXACO-LUBRICATED EQUIPMENT THAN WITH ANY OTHER

Lubricants and Fuels

FOR THE MINING INDUSTRY

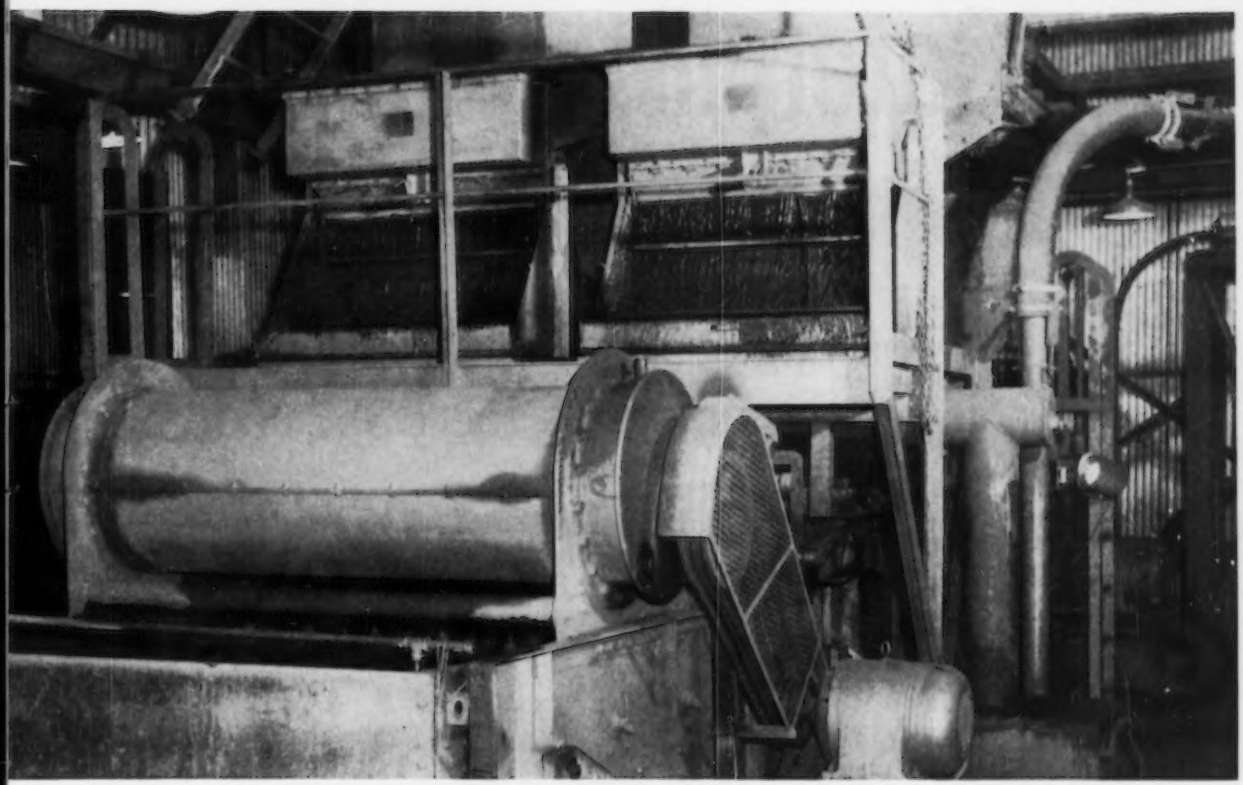


magnetite medium losses reduced in heavy media cyclone plant on Mesabi Range with

DORR -

One of the most serious operating problems in the beneficiation of low grade iron ore in heavy media cyclone plants is high magnetite medium losses and difficulties in maintaining a clean medium free of non-magnetics.

Rear view of unit, note total utilization of entire screen area.



OLIVER DSM SCREEN

At the Mesaba-Cliffs Mining Company's Holman Concentrator at Taconite, Minnesota, the Dorr-Oliver DSM Screens applied to screening of magnetite from cyclone underflow concentrate and overflow tails have consistently reduced the amount of medium sent to the cleaning circuit by 30 to 50% and have reduced medium losses thereby approximately 20%.

Key to the marked superiority of the DSM Screen over conventional screening methods is the non-blinding wedge bar screen, fabricated to tolerances of ±.0015 inches; profile design is such to provide maximum screen life. Capacity of the 4' wide units installed at Holman Concentrator is 75-100 gpm per ft. of screen width when handling minus 8 mesh to 0 material at 70% solids.

For complete information on this newest tool for the mining industries, write for a copy of Bulletin No. 2300. Dorr-Oliver Incorporated, Stamford, Connecticut.

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INCORPORATED
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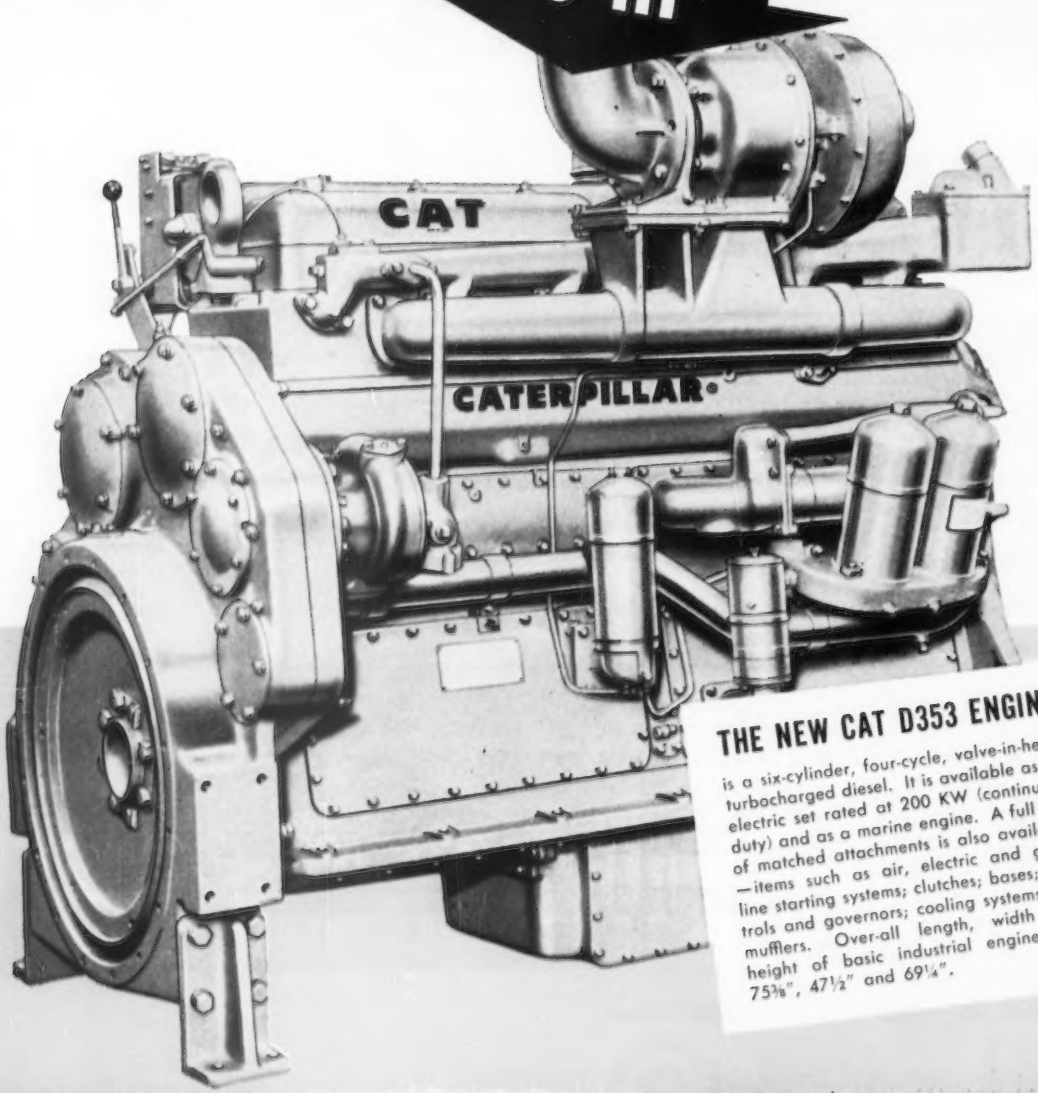
Caterpillar announces in the world's most

The engine that delivered outstanding is now available as the D353 Industrial

D397 650 HP† | D375 430 HP† | **New D353 390 HP†** | D342 225 HP† | D339 140 HP†



THE NEW CAT D353 ENGINE

is a six-cylinder, four-cycle, valve-in-head turbocharged diesel. It is available as an electric set rated at 200 KW (continuous duty) and as a marine engine. A full line of matched attachments is also available —items such as air, electric and gasoline starting systems; clutches; bases; controls and governors; cooling systems and mufflers. Over-all length, width and height of basic industrial engine are: 75⅜", 47½" and 69¼".

another heavy-duty engine advanced line of diesels

performance in the famous D9 Tractor Engine, Electric Set and Marine Engine

D337	D326	D318 (SERIES G)	D315 (SERIES G)	D318	D315	D311
310 HP†	200 HP†	175 HP†	115 HP†	137 HP†	91 HP†	65 HP†

†Maximum output capacity

Adding to Caterpillar's line of modern heavy-duty engines, there's now the Turbocharged D353 rated at 390 HP (maximum output capacity). This engine, a prototype of the unit in the mighty D9 Tractor, is job-proved after thousands of hours of operation in the field!

Like all modern CAT* Diesels, the D353 incorporates in its design the advanced features developed by Caterpillar in a quarter century of diesel leadership. Compact and sturdy, it is built for the hard work. Its four-cycle design delivers the long, effective power stroke that puts power to more efficient use than other types of engines. Its turbocharger utilizes waste energy from the engine exhaust to increase over-all efficiency and economy. Its fuel system requires no adjustment. There are no cylinder ports to clean. And its exclusive Caterpillar single-orifice injection valves, combined with the precombustion chambers, permit the use of a wide range of fuels including premium diesel fuels as well as low-cost No. 2 furnace oil *without fouling*. All these and other features add up to performance that no unit in its power class can match.

With the addition of the D353 to the Caterpillar Engine line, you now have a wider choice than ever for your requirements. Engines are available up to 650 HP (maximum output capacity) and electric sets up to 350 KW (continuous duty). Either as original or replacement power, there's one among hundreds of different arrangements that exactly meets your needs. Leading manufacturers of machinery can supply these models in the equipment they build.

For complete information about the new D353 and other Cat Diesels, see your Caterpillar Dealer. Let him show you how diesel leadership based on a quarter century of experience can engineer the modern, heavy-duty diesels of tomorrow.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

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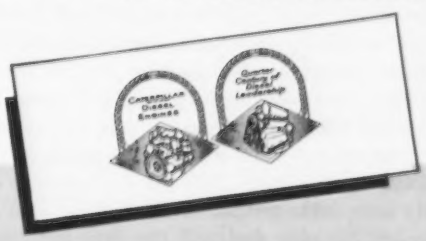


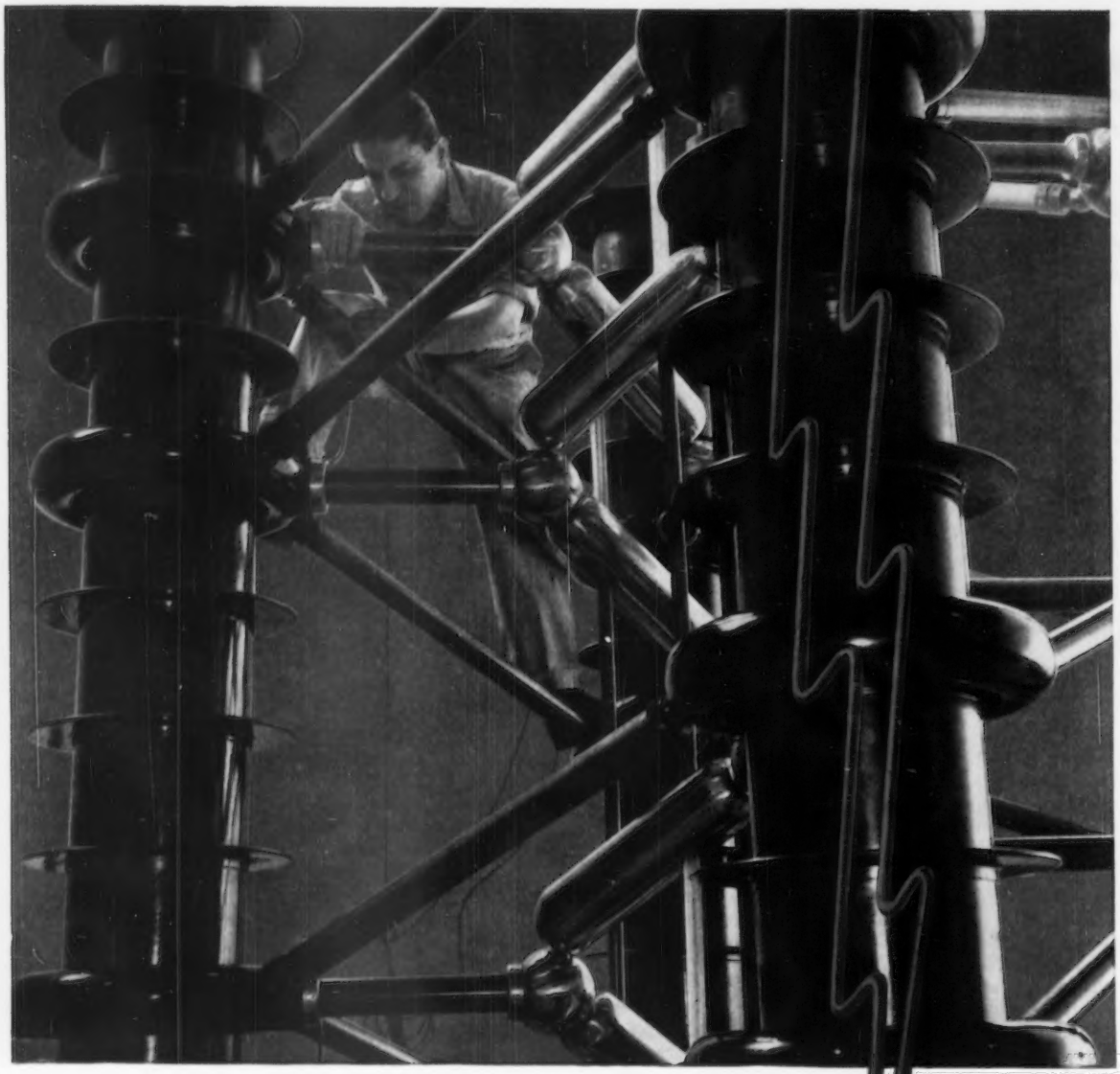
Caterpillar "Firsts" in a Quarter Century of Diesel Leadership

- "Hi-Electro" hardened cylinder liners
- Chemically conditioned cylinder liners
- Stainless-steel piston protectors
- Aluminum alloy bearings
- Interchangeable, adjustment-free fuel injection equipment
- Capsule-type injection valves
- Service meters
- Superior lubricants (detergent oils)
- Notarized, certified power

AND MANY MORE!

Certified Power for Cat Diesel Engines

Through the years, Caterpillar Engines have earned a reputation for *honestly rated power*. Now Caterpillar backs this reputation with a *notarized certificate* covering the horsepower capabilities of each engine. Caterpillar is the first and only manufacturer to give you this assurance of capacity. You have a right to demand *certified power* when you invest in an engine. You get it when you buy from your Caterpillar Dealer!



Simplex Wire & Cable Company's new 1,400,000 volt impulse generator — the first of its kind to be installed in North America — represents just one aspect of research at Simplex. Simplex scientists and engineers originated the process of vulcanizing portable rubber cords and cables in a lead mold. Simplex developed the first heavy-duty portable electrical cable — Simplex TIREX. The first truly moisture-resistant rubber insulation was the outcome of a commercially acceptable method of deproteinization developed by Simplex. Simplex designed the first interlocked armored cable for underground service — Simplex CONDEX. And now — Simplex C-L-X — the portable, corrugated metallic duct WITH SEALED-IN CABLE. **SIMPLEX WIRE & CABLE CO.,** Cambridge, Massachusetts and Newington, New Hampshire.

LIVE BETTER ELECTRICALLY

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Highest quality cables for: Mining • Power & Lighting • Construction • Transportation • Communications • Signalling

MOVING 47 MILLION YARDS TO BUILD DRY-LAND RAILROAD

ACROSS GREAT SALT LAKE!

TIRE MAINTENANCE A MUST — on-the-job experts, on 24-hour call, help keep the fleet rolling. Strategically located, well-equipped, well-manned service like this cuts down time to a minimum wherever Goodyear helps jobs roll.

HERE, MORRISON-KNUDSEN has 600 men and a $15,000,000 array of tools at work "converting" salt water into road-bed. End dump trucks—bottom dump trucks—plus barges, dredges, conveyor belts and electric shovels—are high-balling a causeway 13 miles long, 180′ to 480′ base-width and as much as 70′ above lake-bottom footing. At left is one of these trucks, picking up riprap from borrow. Tires are Hard Rock Lug by Goodyear.

Now—end up to 80% of tire down time:

Specify Goodyear 3-T Nylon Cord

Tubeless!

NOW IN 3-T NYLON CORD—
TUBELESS OR TUBE-TYPE!

HARD ROCK LUG

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ALL-WEATHER EARTHMOVER

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GOODYEAR TIRES

Look for this nearby Goodyear dealer sign for better tire values—better tire care.

Goodyear TUBELESS tires end tube and flap troubles—major cause of truck and earth-mover tire down time. Tube replacement and many-item inventories also end.

You get a bonus in man-hours saved—for repairs and remounting are simpler. Long tire-life is surer, too—for small injuries are easy to spot before extensive damage.

And of course you get TRIPLE-TOUGH 3-T NYLON CORD—that great tire *saver* found only in Goodyear.

Just be sure you specify *Goodyear 3-T Nylon Cord* tubeless tires—and see the *Goodyear* dealer about economical change-over of present equipment. Goodyear, Truck Tire Dept., Akron 16, Ohio.

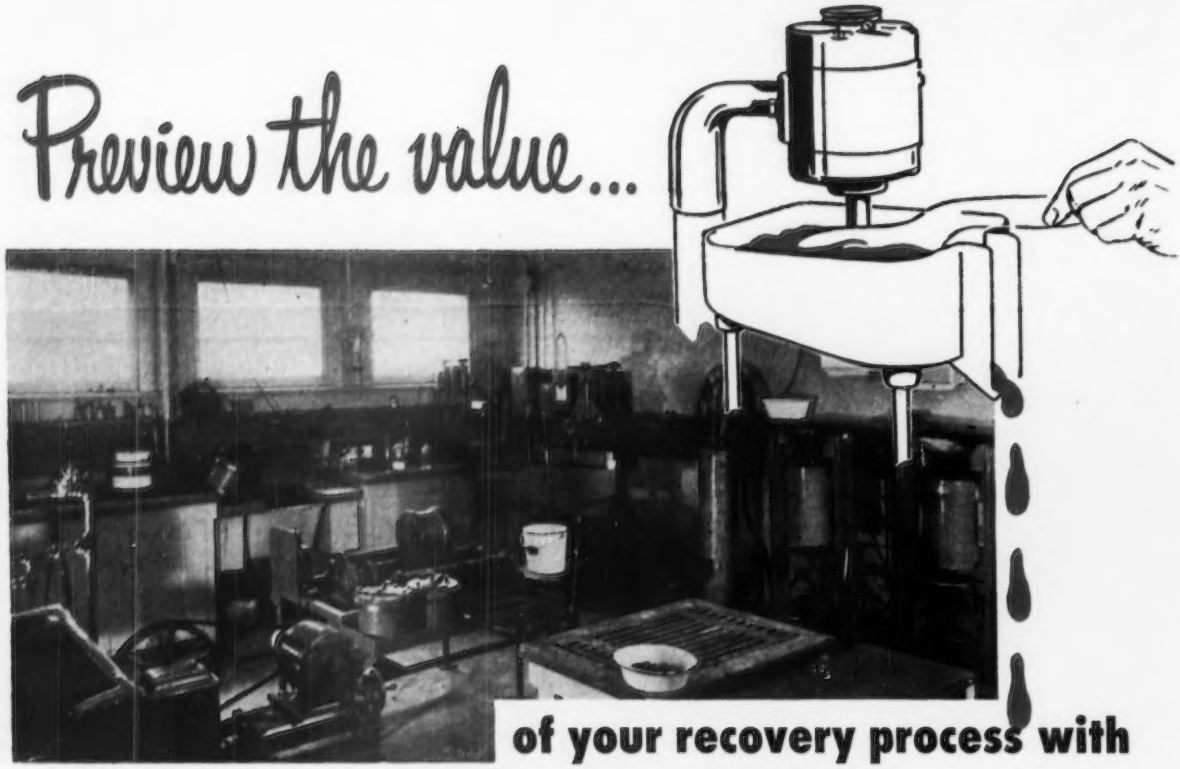
Buy and Specify

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

All-Weather, Road Lug, Sure-Grip—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

Preview the value...



of your recovery process with

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Galigher engineers keep well abreast of the changing and advancing art of ore treatment, both in methods and equipment. Whether yours is a projected or an established plant, test work on representative samples acts as a guide to insure a profitable mill operation. Galigher metallurgical service can help you avoid the pitfalls of inaccurate data and faulty design.

Many years of successful pioneering experience, on a world-wide scale, is your assurance that collaboration with Galigher metallurgists will lead to the efficient procedure and operation of your treatment plant.

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NORTHWEST
meets the HARD ROCK TEST!

HARD ROCK Men know that rock is the real test of shovel equipment. Any shovel can dig dirt. Look at the stuff in the picture. Hard—and frozen. This is overburden in the rugged pits of one of the many copper mines in southern B. C.

Northwests are built for rock and if you have a *real* Rock Shovel you never have to worry about getting profitable output in any kind of digging. Northwests load fast. Plenty of power combined with the Northwest Dual Independent Crowd that utilizes force most independent crowd shovels waste cuts through the bank without stuttering. Uniform Pressure Swing Clutches take the jerks and grabs out of swinging and make spotting accurate without wasting time jockeying a load over the truck. The Cushion Clutch eliminates shock overloads before they reach the machinery. Northwest Booms, Northwest Machinery Bases, Northwest Crawlers are all designed and built to meet the worst jobs a shovel has to do.

These are just a few of the things that combine to give you a machine that will make money on your job.

If you are planning on new shovel equipment, ask for the latest information on Northwest before you buy. A Northwest man will be glad to give you complete details.

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THE GREATEST COMBINATION OF PROVED ADVANTAGES EVER BUILT INTO A SHOVEL, CRANE, DRAGLINE OR PULLSHOVEL

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem

S-25-12-IG

"We increased our cable life

Supervisor checks the cable where it makes an "S" curve. Thin tubing overhead is for mine's pneumatic blasting system.

Shuttle car unloads itself with built-in conveyor. Notice twisted Tiger Brand cable above man's head.

with TIGER BRAND,"

—*says Master Mechanic of a large Pennsylvania mine*

THE mine shown here is clean and modern, but it has just one purpose: to produce coal at a profit under safe working conditions. The mine has about 30 miles of trackway, and produces about 4,500 tons daily. About a dozen shuttle cars are in constant use, between rail heads and working faces that are frequently 100 to 200 yards apart.

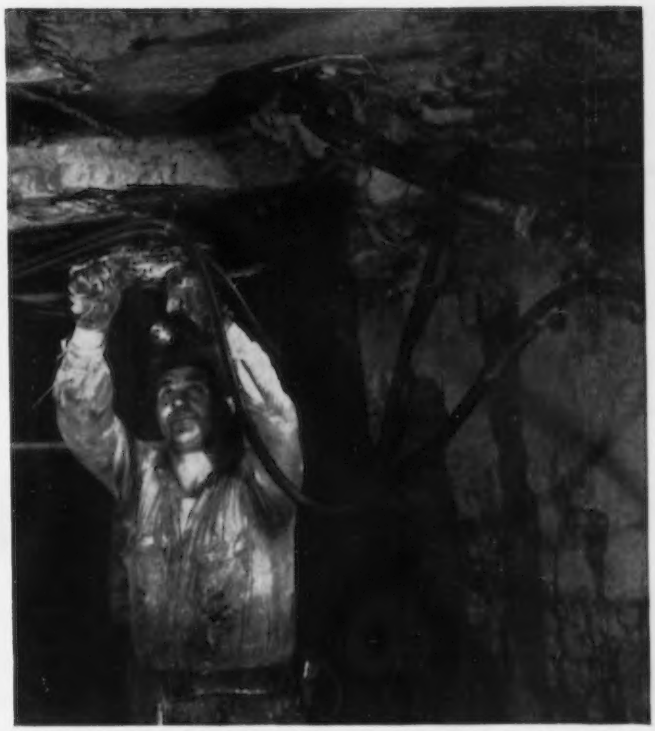
The shuttle car electrical cable takes a terrific beating. The car often takes a circuitous route, and the cable is pulled tight around the corners of standing coal while it is reeled and unreeled without stop for the entire shift.

The Tiger Brand cable has outlasted the previous cable by a considerable margin. This is partly due to our "Bridgewall" construction, which actually puts a sheath of live jacket rubber around each conductor. Even when the cable is kinked or smashed, the conductors are protected by a thick wall of the toughest jacketing compound available in the industry.

The other factor that contributes to long trouble-free life is the dynamically balanced rope lay conductors. Concentric stranded wires of the ideal size—as opposed to loosely bunched groups of fine wires—are carefully prestressed to give balanced performance and freedom from unequal elongation between conductors.

Tiger Brand cable isn't cheap, but it's a good investment for any company that needs long, hard service. See your American Steel & Wire salesman.

AMERICAN STEEL & WIRE DIVISION
United States Steel, General Offices: Cleveland, Ohio
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY NEW YORK



Workman ties up cable. Spring-loaded strain reliefs are used when possible. Tape on cable prevents it from slipping through the relief.

Shuttle car makes return trip. Cable feed center is out of picture 100 yards or so to the left, near the rail head.

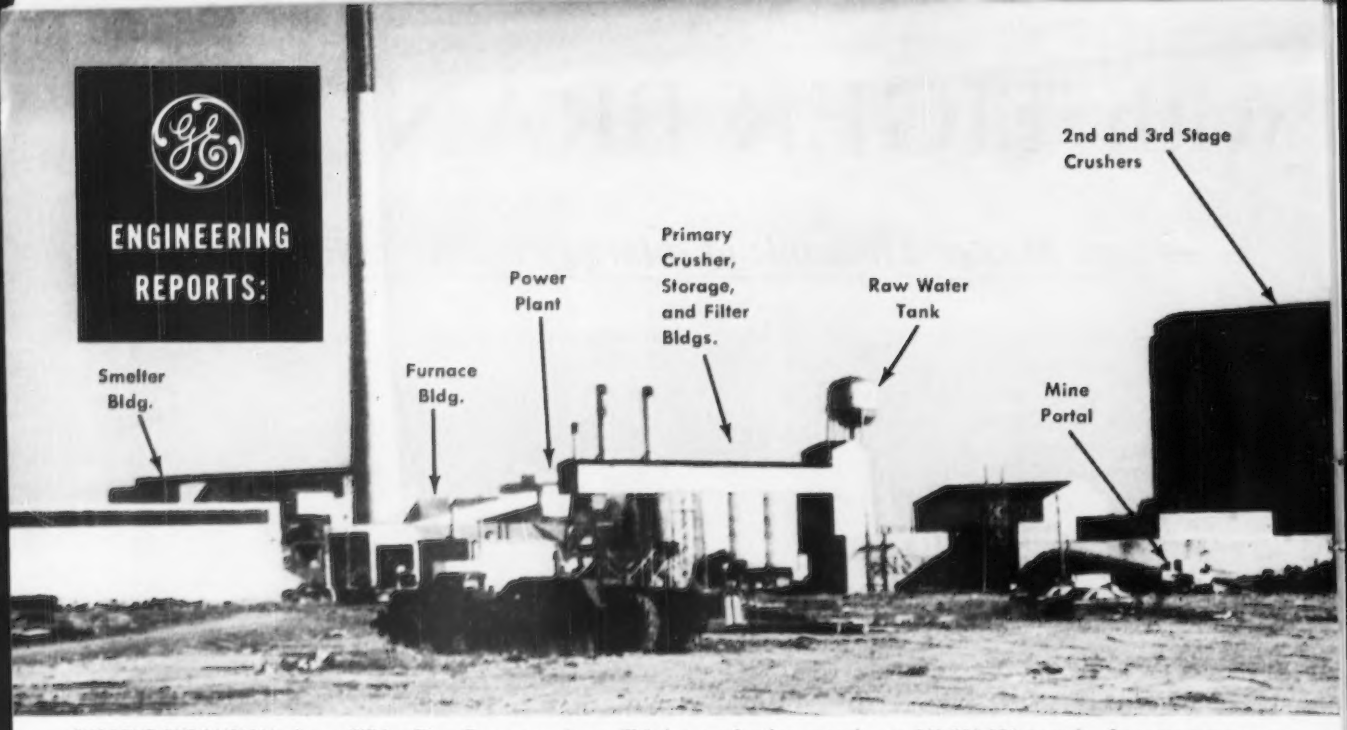
USS TIGER BRAND ELECTRICAL WIRE & CABLE
a standard Tiger Brand cable for every special job

- Asbestos Wire and Cable
- Mold Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

USS

UNITED STATES STEEL

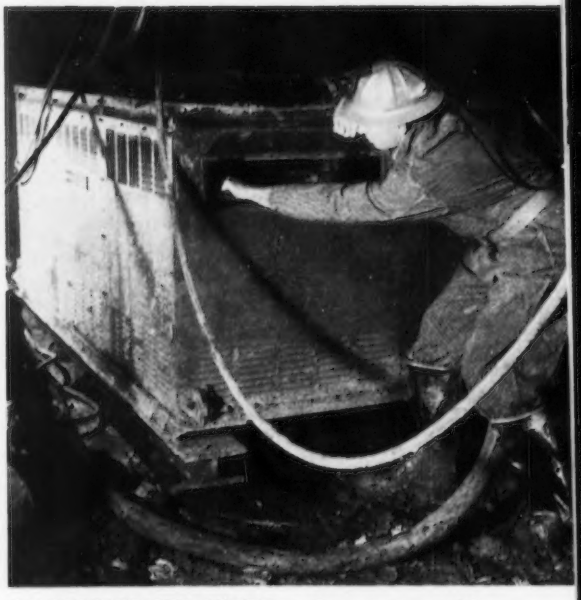
ENGINEERING REPORTS:



CURRENT EXPANSION of new White Pine Copper project will bring production capacity to 100,000,000 pounds of copper per year.

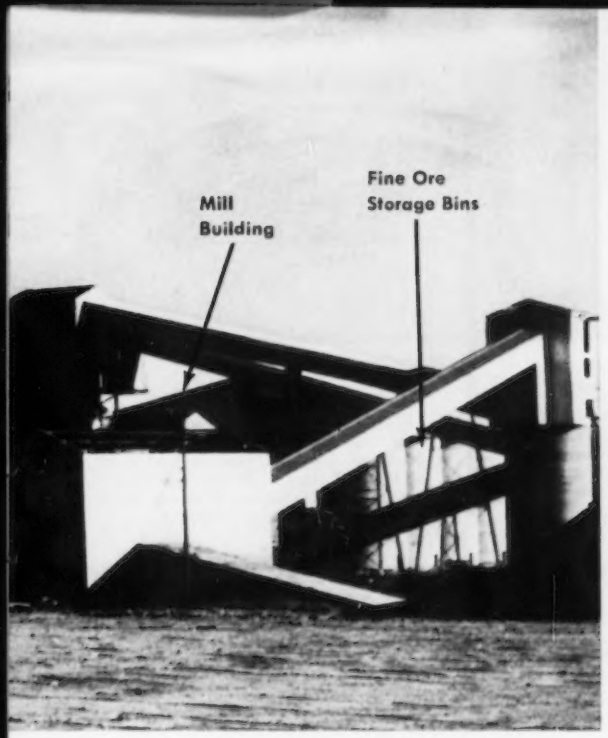
New White Pine Copper project now

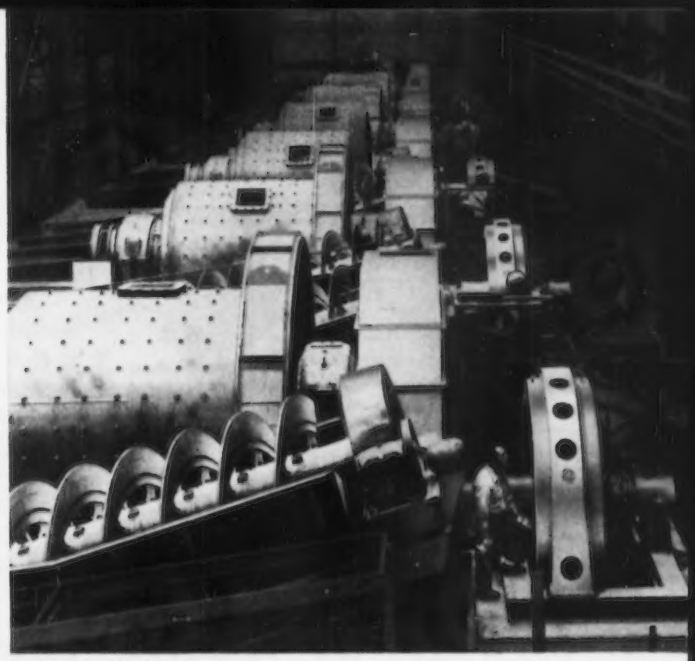
SYSTEM PROTECTION against short circuits is provided by reliable General Electric metal-clad switchgear with vertical-lift magne-blast circuit breakers. Factory-assembled, it is easily installed and maintained.



A-C UNDERGROUND MINING, an important trend in the industry, is utilized in White Pine mine. This G-E 400-kva mine power center steps down voltage close to mining load, minimizing voltage drop.

◀ **SERVICE DEPENDABILITY** and low maintenance are advantages of two General Electric diesel-electric locomotives at White Pine. This 45-ton unit is used for yard switching and supplying coal to boilers.





PROPERLY CHOSEN to match mill starting torque with supply-system stiffness, six General Electric 1500-hp, 4000-v, 150-rpm, low-speed synchronous motors (five shown) power 12-ft by 13-ft ball mills.

producing 90,000,000 lb per year

System-engineered General Electric equipment helps improve production efficiency, eases future expansion

Mining experts predict that within the next ten years the rate of copper consumption will rise approximately 61%†. To meet this increased demand, major U.S. copper producers are increasing their production facilities. One of these producers is White Pine Copper Company, whose new mine, mill and smelter at White Pine, Mich., recently reached an annual capacity of 90,000,000 pounds of low-grade ore after two years' operation.

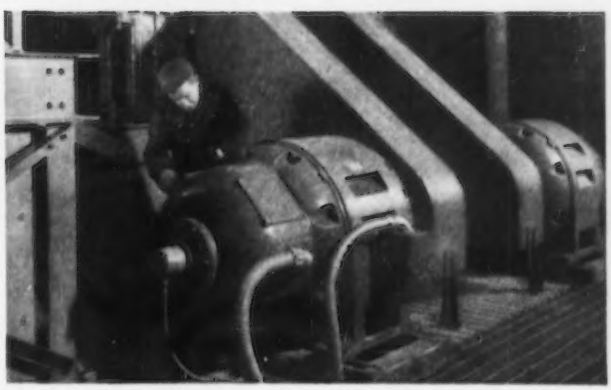
The major part of the electrical system for this important installation was supplied by General Electric. General Electric system engineers worked closely with White Pine engineers and their consultants to develop a flexible a-c distribution system in the underground mining operation and helped determine mill torque needs for the heavy ball mills, which are among the world's largest. The entire electrical system was arranged to ease future expansion by simply adding new production units.

When you build, expand or modernize your mining facilities, call on your nearest General Electric Apparatus Sales Office early in the planning stages or write General Electric Company, Section 660-37, Schenectady 5, N. Y.

†Based on a study by McGraw-Hill Publishing Co., Inc.

Engineered Electrical Systems for the Mining Industry

GENERAL ELECTRIC



INCREASED CAPACITY at White Pine requires additional mine belt conveyors. Two heavy-duty G-E Tri-Clad* 200-hp motors drive two 54-in. belts carrying ore from mine to primary crushing.
*Reg. trade-mark of General Electric Co.

HIGHLY RELIABLE General Electric Tri-Clad motors with dripproof enclosures, rated 15 hp, are particularly suited for driving a battery of flotation cells in the White Pine smelting operation.

faster loading...

L-W Rear-Dumps position fast... usually spot under shovel in one continuous motion, with little "jockeying". Big, wide top opening gives shovel-operator easy "target". Low rear entry speeds dipper swing, reduces spillage.

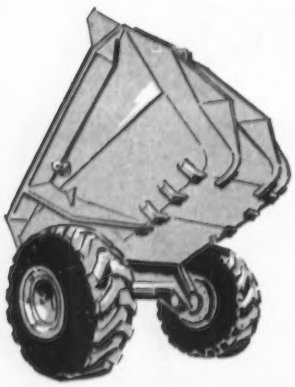
hauls anywhere...

Rough haul roads, uneven terrain, deep mud seldom stop L-W Rear-Dumps. Wide, low-pressure tires, exclusive power-transfer differential, good low weight distribution, electric steer, all help provide go-anywhere traction.

dumps cleaner...

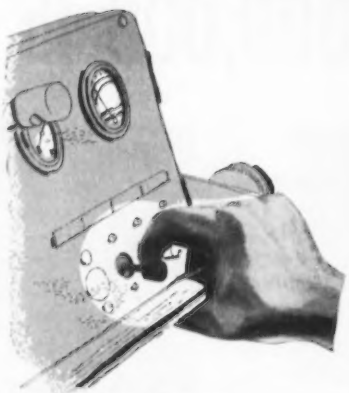
Touch of electric switch raises bowl fast, with edge behind, below rear wheels for over-bank dumping. Tapered bowl sheds all material rapidly. Electric controls permit fast dump or controlled spread. Front-wheel-drive permits easy pull-out.

these Rear-Dump features serve you two ways...



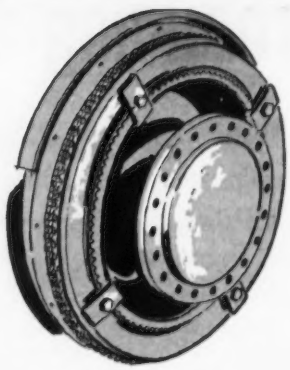
reduces maintenance...

Repair bills are lower, daily lube time shorter, because L-W Rear-Dumps eliminate such troublemakers as hydraulics, springs, long drive-shaft, universal joints, tie-rods, small steer-wheels, frame.



easier operation...

Production stays high all day long because many fatigue factors are reduced. Big tires, foam cushion seat, smooth out ride for operator. Fingertip switches replace hard-to-handle levers.



greater safety...

Multi-disc air brakes provide more brake surface per wheel than most haulers have on all four. Low center of gravity, excellent visibility, front-wheel-drive, and easy control, also boost safety.

easier to own...

L-W Rear-Dumps are competitively-priced. Because they last longer, cost less to maintain, and *produce* more, your savings are substantial. They pay bigger dividends, faster, on your investment.

insures future earnings...

Behind same Tournapull prime-mover you can interchange scraper, crane, bottom-dump, and other trail units. With them, you can keep these units profitably busy on any type of future operation.

job-proven...

L-W Rear-Dumps are at work wherever shovel material is being hauled by modern methods and modern equipment. Hundreds have been in world-wide use for years in mines, quarries, collieries.

advertisement continued

Every one of the big advantages of LeTourneau-Westinghouse Tournapull® Rear-Dumps has the same double-barreled purpose: *to build up your production and cut your costs.* These heavy-duty units have been designed and built to answer your requirements for a big, fast, powerful, rugged, dirt, rock and ore hauler . . . one with custom features at standard prices.

Take one look at a L-W Rear-Dump and you'll see it's radically different from ordinary haul units. It's *not* just a beefed-up, souped-up version of a big highway truck. Much simpler in design — and much more rugged — the L-W Rear-Dump is *a specialized machine designed for tough usage, rough haul surfaces, and big-shovel loading.*

The unusual "frameless" construction of the L-W Rear-Dump is only one of the features that make it a more profitable tool for you. From its broad, deep-lugged tires to its sturdily-built top rim, this hauler is packed with mechanical advantages — most of them exclusive with LeTourneau-Westinghouse — that make it the *most practical hauler available today.*

1. bigger production...
2. lower hauling costs

L-W Rear-Dumps move any bulk materials anywhere...at lowest net-cost-per-ton

Check over these features carefully. Estimate what they could mean to you in bigger production, reduced repair bills. Check off how many ways, every operating day, they could do faster hauling for you, at less cost. Compare them with other haulers on the market. You can see . . . and pocket . . . the difference!

Nelson Bros. Quarries, LaHarpe, Kansas, praise their 3 Model C LeTourneau-Westinghouse Rear-Dumps. These three 22-ton units often haul up to 4,000 tons of blast-rock per day. "Rugged, with plenty of power," says Supt. Carl Nelson. "Beat anything I've seen."

Copyright 1957 by LeTourneau-Westinghouse Co.

see more on next page

...these Rear-Dump features cut

ALL STEEL body resists dents, abrasion

Big-chunk rock loads drop safely into an L-W Rear-Dump. Its bowl is made of heavy steel plate, rigidly reinforced with box-beam ribs and is the heaviest and finest on the market today. Tool-steel strips are welded to the bottom for even greater strength. The bowl floor is small, so the first dipperful acts as a cushion for the rest of the load. Side surfaces are slanted, to take blows at an angle, over a larger surface.

The Tournapull® prime-mover is built for strength, too. To eliminate strain and stress on the power train, its main case is rugged, rigid . , . built of steel plates ranging up to 1½" thick. It has no projecting parts to be damaged by falling rocks.

BIG TIRES smooth out shocks, vibration

Four big tires act as huge shock absorbers for the L-W Rear-Dump. These wide, flexible, low-pressure tires dissipate the vibrations and stress of high-speed hauls. Their "springy" action absorbs the shock of a heavy load dropping into the bowl.

These giant tires flex and roll easily over rocks that might bruise or break smaller duals. They have no divided face where wedged-in rock fragments can wear and tear. These big singles even clean themselves in flexing. Their thicker carcass, larger volume of air, and longer rolling arc make them more flexible, cooler running, longer lasting. Some mine and quarry owners report up to 7,000 hours of wear without recapping.

ELECTRIC controls: weatherproof, wearproof

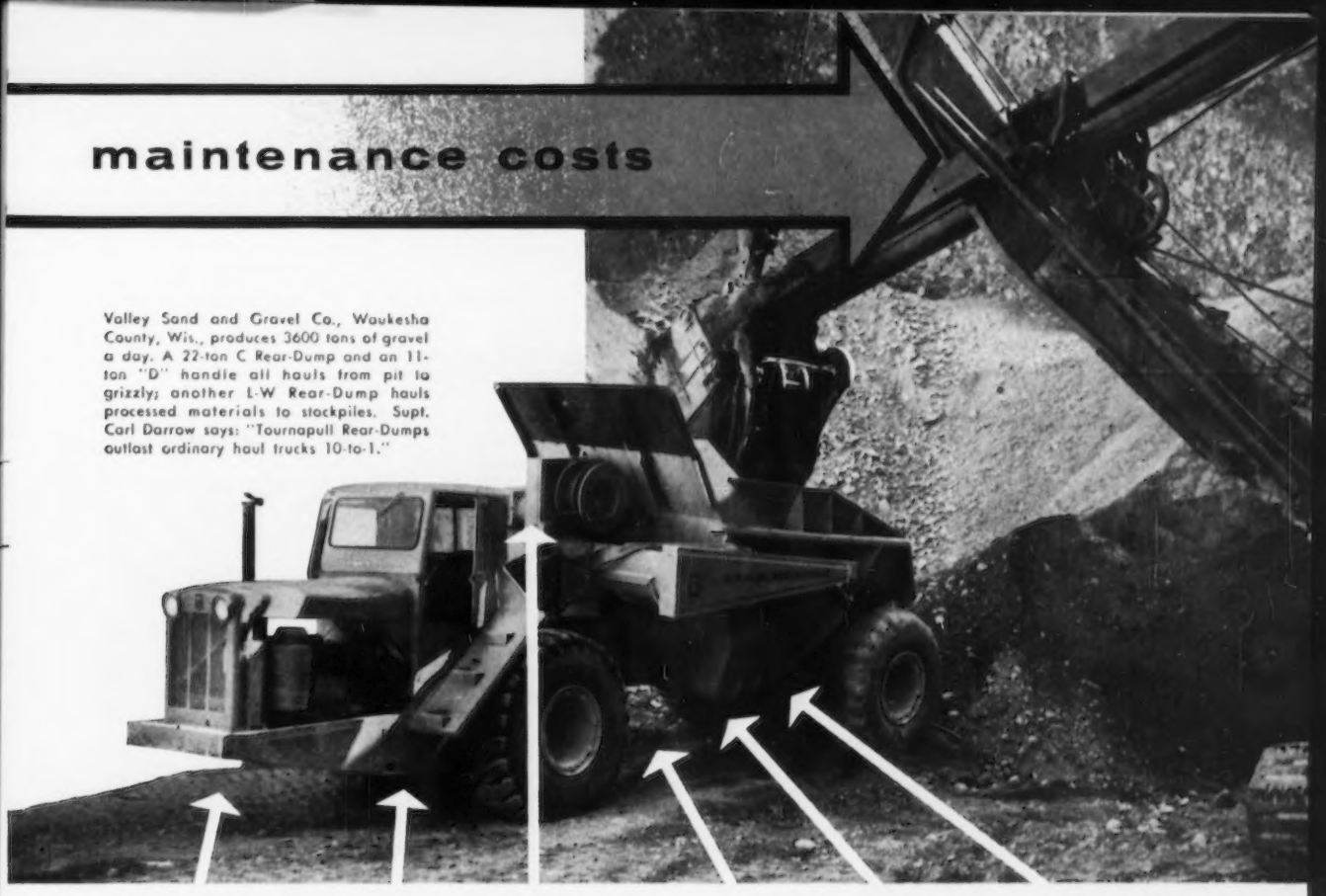
L-W Rear-Dump bowl action and steer are controlled by fast, powerful, dependable electric controls. A fingertip switch actuates the system . . . starts current flowing from a simple, trouble-free generator through heavy-duty, flexible, insulated wire to a high-torque motor at point of action. "Squirrel-cage" motors are basic, simple, have only 2 parts . . . rotor and stator . . . are weatherproof, waterproof, dustproof.

L-W's electric system has few parts . . . and many are interchangeable. It reduces power-transmission lines to a minimum, needs only the shortest of control cables. No special skills are required for repair — one simple instrument pinpoints where any trouble may be. The whole system is as easy to service as the dozens of electrical appliances you've been taking care of around your home or office for years.

Unlike hydraulic or mechanically-geared power systems, the L-W electric control always operates at full efficiency. If something *has* gone wrong, you don't limp along at production-reducing "half strength", or risk the danger of being without sufficient power in an emergency. Instead, you know *immediately* that service is needed. You know at once where to look for your trouble. You can make repairs in a hurry and get back to top production fast!

continued

maintenance costs



Valley Sand and Gravel Co., Waukesha County, Wis., produces 3600 tons of gravel a day. A 22-ton C Rear-Dump and an 11-ton "D" handle all hauls from pit to grizzly; another L-W Rear-Dump hauls processed materials to stockpiles. Supt. Carl Darrow says: "Tournapull Rear-Dumps outlast ordinary haul trucks 10-to-1."

no front "steer wheels" to misalign

no tie-rods to bend

no hydraulics to leak or break

no springs to replace

no frame to warp

no long drive-shaft to service

Frameless construction eliminates "troublemaker" parts

L-W Rear-Dumps are radically different — and much simpler — than conventional haulers. Bowl and prime-mover are hitched through a horizontal yoke extending back from the kingpin, and pivoted to the body itself just above and ahead of the rear wheels. This construction is simpler, stronger — has no frame, or sub-frame to get out of line.

There are no springs, hangers, tie-rods; L-W Rear-Dump's big tires adequately absorb the shocks of rough haul-road travel and high-speed loading. Front-wheel-drive and kingpin steer further simplify maintenance . . . eliminate small front wheels, long drive-shaft, hinged steering connections . . . that are subject to misalignment and need frequent lubrication.

With electric motor-driven winch for dump action you eliminate all the headaches of hydraulic systems. There are no troublesome oil seals and pumps, no freezing up in cold weather, no revving up to build up power to dump, no leaks or breaks. Both up and down motions of bowl are powered, so you avoid the shocks of gravity dumping.

Built-in safety features protect your investment

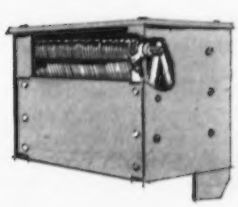
Sure-stop brakes

Each wheel of the Tournapull Rear-Dump has more braking surface than all four wheels of any comparable hauler. Instead of narrow brake shoes and drums, this brake design uses multiple discs splined alternately to wheels and axles. Foot-pedal-controlled air pressure forces discs together, to bring loaded units to a safe, sure, smooth stop.

Deep-bucket seat

Operator sits high, can see what he's doing, where he's going. He relaxes on a thick, comfortable, form cushion seat that absorbs much of the vibration and shock of operation. Seat helps keep him efficient all shift-long . . . reduces the fatigue that can mean slow response in tight spots.

Electrotarder



Tournapull's electric system also furnishes braking horsepower through Electrotarder . . . standard on the B Rear-Dump and optional on other models. This auxiliary braking unit sets up an electrical resistance on the generator, creates a drag on the engine strong enough to cut your speed down to a "walk" on long, downhill hauls *without use of service brakes*. Electrotarder has no moving parts to wear out . . . prolongs life of service brakes. Torque-converter "B" offers same feature in hydraulic retarder.

Power steering

Operator has complete control of L-W Rear-Dump at all times with electric-motor kingpin steer. Just a flick of a dashboard switch (or slight turn of steering wheel on Model B) turns the unit right or left up to a full 90°. Steering action stops the instant switch or wheel is released, then brake locks steer motor. This effortless, quick-response steering is another big L-W Rear-Dump safety feature.

see more on next page

here's how these feature-packed haulers

Fast loading

One of the reasons L-W Rear-Dumps haul more payloads per shift is that they can be *loaded* in a hurry. Maneuverable wagon-type steer lets units back in close to the shovel, usually in one pass. They eliminate time-wasting jockeying, because they can turn a full 90°, make continuous U-turns in less than their own length — in *25% less* than their length with bowl up! In narrow pits, restricted benches, mine tunnels, they maneuver fast, sure, quick . . . need no special turn-arounds or troublesome skid-plates.

Unit's big, wide, unobstructed top makes an easy target for your shovel operators. And low, wide, rear entry of this hauler lets the dipper swing in smoothly, quickly . . . in one continuous arc . . . rather than the up-over-in, up-over-out motions needed with high-top trucks. Bowl's top rim is sturdily built to permit lip loading of big rock.

HAUL anywhere

You'll find your L-W Rear-Dumps haul steadily, at fastest practical speeds — whether their routes are smooth, clean, and well-maintained, or rough, rutted, and slippery. Big, deep-lugged tires give excellent traction and flotation. Loaded rigs have 45 to 50% of total weight on drive-wheels for better pull-power. And there's plenty of usable engine power available through a wide selection of gear ranges. In addition, 22-ton "C" and 35-ton "B" are available with torque converter and power-shift transmission, for automatic matching of torque and power to load.

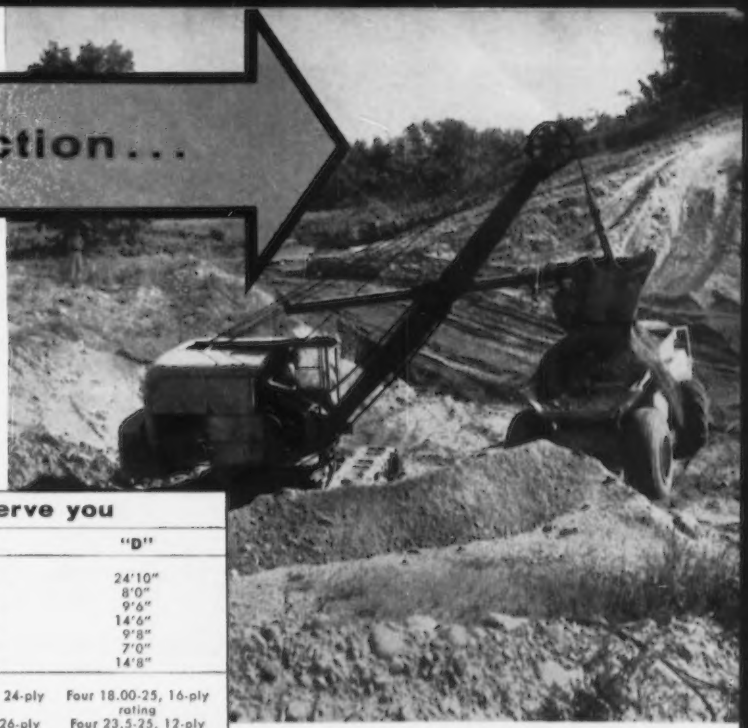
In soft, slippery areas, these "go-anywhere" haulers offer three big operating advantages: (1) Exclusive power-transfer differential, which automatically transfers power from a slipping drive-wheel to the wheel on better footing. (2) 90° kingpin steer, with which you can often "duck-walk" out of trouble. Operator just turns prime-mover left, right, left, etc. . . . swinging drive wheels ahead from side to side until they "walk" out and reach solid footing. (3) Independent front and rear-wheel braking and frameless construction, which let you "hump" forward off soft footing when bowl is empty. Raising dump-body shortens wheel-base. Therefore, by first *raising* bowl with front brakes locked and rear brakes released . . . then *lowering* bowl with rear brakes held and front released . . . Tournapull® "humps" forward in good-sized strides, without use of drive wheels.

DUMP quicker

Just as it does in spotting for loading, your L-W Rear-Dump gets into dumping position *fast*. A touch of a fingertip switch dumps the load quickly, cleanly. The smooth, rounded interior and high lift of the bowl lets every particle of material slide out. There's no carry-back to steal power and reduce capacity.

Exceptional, too, is the accurate load *placement* possible with L-W Rear-Dumps. With front-wheel-drive, independent braking and sure-footed tires, operator can get up closer to dump area. Bowl-lip swings deep behind rear wheels, so he needn't worry about roll-back . . . material is cast out and away. If you wish, dump on the level can be made on-the-run, for fast spread. Electric power-up and power-down control of bowl position makes it easy to spread most materials evenly.

boost your production...



This is the shortest route from pit to plant at Nashville Gravel Co., Nashville, Mich. Road to the left is the "long way around". Nashville's LeTourneau-Westinghouse D Rear-Dump has no difficulty with the shortcut ... climbs its steep grades easily, quickly. Competitive units at the quarry had trouble ... actually couldn't negotiate the hill at all until "D" had pioneered and compacted it by frequent trips. Owner F. G. Cheney says: "We like our L-W Rear-Dump because it delivers more material."

11, 22, and 35-ton sizes to serve you

Model	"B"	"C"	"D"
Overall Dimensions			
Length	35'10"	29'6"	24'10"
Width	12'6"	11'3"	8'0"
Height	14'0"	11'4"	9'6"
Wheelbase	20'8"	16'4"	14'6"
Wheelbase (Dump Position)	12'4"	8'1"	9'8"
Average Loading Height	10'6"	8'3"	7'0"
Height (Extreme Dump Position)	20'4"	17'2"	14'8"
Tires			
Std.	Four 27.00-33, 30-ply rating	Four 24.00-25, 24-ply rating	Four 18.00-25, 16-ply rating
Opt.	Four 27.00-33, 36-ply rating	Four 26.5-25, 26-ply rating	Four 23.5-25, 12-ply rating
Gauge			
Tournapull	8'	6'11"	6'3"
Rear-Dump	10'	9'	6'3"
Ground Clearance			
Tournapull	24"	17½"	15½"
Rear-Dump	34"	26"	24"
Turning			
Maximum Angle (left and right)	90°	90°	90°
Width Required for 180° Turn	35'	28'8"	24'8"
Width Required for 180° Turn (Dump Position)	27'	20'8"	18'8"
Brakes (Multiple-disc air brakes on all four wheels)			
Braking Surface (sq. in.)	7,488	3,762	2,800
Weight			
Approx. Shipping Weight (lbs.)	73,700	43,800	22,300
Distribution			
Empty			
Front	66%	68%	70%
Rear	34%	32%	30%
Loaded			
Front	45%	50%	50%
Rear	55%	50%	50%
Engine	300 HP GM, 335 or 300 HP Cummins	210 HP GM, or 200 HP Cummins	138 HP GM
Transmission	Fuller 5F-1220, or Allison Torque Converter	Fuller 5A-1120, or L-W with Tournaschneider Torque Converter	Fuller 5A-650
Differential	Power-transfer	Power-transfer	Power-transfer
Clutch	Rockford 16" double plate	Lipe-Rollway 17" single plate	Rockford 14" single plate

Speed in MPH	Allison Power Shift	Step Gear Low Range	Step Gear High Range	Power Shift	Step Gear	Step Gear
Forward						
1st	4.0	3.2	4.6	2.3	3.1	3.2
2nd	10.0	5.8	8.3	5.4	6.6	6.1
3rd	20.0	11.1	16.1	12.2	11.6	11.9
4th	30.0	19.3	28.0	28.0	20.4	20.7
5th		23.7	34.3		32.1	29.5
Reverse						
1st	3.9	2.9		5.1	4.0	3.2
2nd	5.8	4.2		11.8		

Capacity			
Tons	35	22	11
Cubic Yards			
Heaped	27	17	8
Struck	23	14.7	7
Bowl Dimensions			
Length	15'6"	10'10"	10'11"
Width (Inside)	10'2"	8'9"	6'0"
Depth (Max.)	7'0"	6'4"	5'3"
Angle of Dump	58°	66°	52°
Interchangeable Attachments	Scraper Crane	Scraper Bottom-Dump Crane Flat-Bed Hauler	Scraper Crane Flat-Bed Hauler Bulldozer Logging Arch Transit-Mixer

Prime-mover does double duty

You get extra earning potential with L-W Rear-Dumps, because their dump bowls can be interchanged quickly, economically, with other trail units, behind the same prime-mover. For example, switch your Rear-Dump body for a scraper and you can load, haul, and spread overburden ... build haul roads ... handle outside dirt-moving ... or rent to a contractor. Interchangeable units use the same wheels, brakes, and electric-control system. This cuts the cost of each extra work-unit to about 25% of original complete unit investment. Available are scrapers, lift-and-carry cranes, side- and bottom-dumps, and flat-bed haulers.

See L-W Rear-Dump in action

Best way to check closely the profit-building advantages of L-W Rear-Dumps is by a working demonstration. To arrange one, just contact your nearby LeTourneau-Westinghouse Distributor. He'll take care of all details. Ask him, too, about work-and-run Tournatractor® for pit and plant clean-up work ... 26.7 mph Adams* Trave-Loader, for mobile, mass production truck-loading of loose material ... 15-speed Adams graders for high-speed haul-road maintenance ... and Tournapull load-haul-and-spread scrapers for stripping and other low-cost, pay-yard dirtmoving.

*Trademark R-1615-M-6

LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

NEW 1958 CHEVROLET TRUCKS WITH NEW HUSTLE! NEW MUSCLE! NEW STYLE!

Just look at all they offer that's new and better . . . and you'll see why these new Chevies are the fleetest, sturdiest, handsomest dollar-savers yet! Meet Chevrolet for '58!

NEW MEDIUM-DUTY VIKINGS

Hardy Vikings roll in with nine brand-new models, offering new cab-to-rear-axle dimensions for improved semi-trailer, dump, stake and van-type operations. Options available boost GVW ratings all the way to 21,000 lbs. And you get traditional Chevrolet economy in the industry's most popular 6's and in V8's packing up to 175 h.p.

NEW HEAVY-DUTY SPARTANS

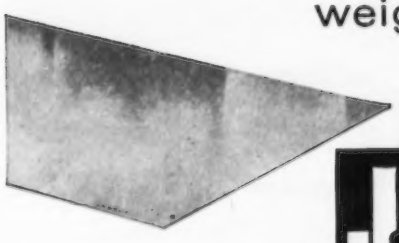
The robust Spartans make hauling history with the revolutionary 230-h.p. Workmaster V8 with Wedge-Head design. The combustion chambers are located in the cylinder block rather than in the cylinder head. Here's maximum power, less wear than ever. It's featured on 90 and 100 Series trucks as are sturdy cast-spoke wheels and an 18,000-lb. rear axle. Look over Task-Force 58 at your Chevrolet dealer's. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

CHEVROLET

SEE THE LATEST EDITIONS OF THE "BIG WHEEL" IN TRUCKS—1958 CHEVROLET TASK·FORCE TRUCKS

JALTEN low alloy high-strength J & L steel

provides equal strength with lighter weight



Jalten permits high design loads with reduction in section. Usual reduction is two gages with weight saving as much as 25%.

High strength of Jalten is the result of balanced chemical composition which is carefully controlled during production. Jalten's strength is retained through fabrication and welding without further heat treatment.

Jalten is available in the forms you require (plates, hot rolled sheets, hot rolled bars, small shapes and structurals). Jalten can be purchased in three grades to meet specific requirements for high strength, formability, impact, resistance to corrosion.

Your local distributor can supply you with information on Jalten, or you can write direct to the Jones & Laughlin Steel Corporation, Dept. 412, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

J&L STEEL

Jones & Laughlin

... a great name in steel

Got a WATER PROBLEM ?...

De-watering. Water supply. Hydraulicking. Tailings. Sand and gravel conveying. For any service like this, you'll find that NAYLOR spiralweld pipe will more than fill the bill. Here's a light weight pipe that's easy to handle and install, yet it's built with extra strength and safety for the tough jobs. Lines can be made up faster, especially when joined with the one-piece NAYLOR Wedgelock coupling. For details, ask for Bulletins No. 507 and No. 513.

NAYLOR

NAYLOR PIPE COMPANY
1243 East 92nd Street, Chicago 19, Illinois

Eastern U.S. and Foreign Sales Office:
60 East 42nd Street, New York 17, New York

FULL MEASURE—FROM CUT TO FILL!

Big Diesel Power . . . Allis-Chalmers 844-cu in. engine delivers more power per pound of gross vehicle weight . . . more torque when loading . . . more *drive* when hauling and spreading.

Correct Weight Distribution. When empty, 66 percent of weight is carried on tractor wheels for greater driving ability. When loaded, the total weight is equally distributed on each of the four wheels for maximum flotation, traction and tire life.

Exceptional Maneuverability with fast, positive 90° steering. Positions quickly in the cut, moves fast off the fill. Two-stage hydraulic steering maintains accurate control on the haul road.

The TS-260 also offers true "boiling action" loading . . . positive forward forced ejection for quick, clean spreading . . . heavy-duty power train . . . and many other advantages you'll have to *see* to fully evaluate. Ask your nearby Allis-Chalmers dealer for a working demonstration soon, on *your* job, and see why the profit-producing TS-260's are making new friends every day. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

Engineering in Action

Special auxiliary wheels . . . to meet highway weight limits. Twin front wheels are attached quickly and easily to distribute weight . . . let you move the TS-260 between jobs on its own power.

First on the job

THE AUTOCAR

When the going is tough and slippery, Autocar 6-Wheelers make it every time. You can't beat them for bulling heavy loads through mud, sand, wet clay, deep snow and ice. And on soft roads they give you turnpike traction. The axles of 6-wheelers provide extra driving wheels—a double contact with the road that brings you safely through. There are several tandem axles to choose from with ratings from 34,000 to 70,000 pounds, and Autocar engineers will help you choose the one that precisely meets your conditions of road and load. Then, in accordance with Autocar's custom-building practice, they design the rest of the unit to match—an integrated set of balanced heavy-duty components. The Autocar 6-Wheeler, like every other Autocar, has long life and stamina built into it. For the full story on the job these 6-wheelers can do for you, see your White-Autocar distributor.

White Autocar

AUTOCAR TRUCKS

AUTOCAR DIVISION

The White Motor Company • Exton, Pa.

after the storm

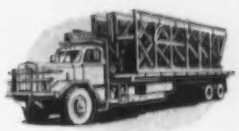
6-WHEELER

THE AUTOCAR 6-WHEEL CEMENT MIXER, capacities from 5½ to 14 cubic yards. Designed as an integrated, balanced unit, and specifically for the job.

THE AUTOCAR 6-WHEEL HIGHWAY TRACTOR pulls heavy payloads on long hauls. A real profitmaker in those states where multiple axles permit additional payload.

THE AUTOCAR 6-WHEEL LUMBER TRUCK drives right into the felling area and picks up a profitable load, with the sturdy construction and braking power to control it.

THE AUTOCAR 6-WHEEL OIL FIELD UNIT, ideal for hauling heavy loads. A sure winner over a rough track and geared to keep up with traffic on the highway.



Dump in *one second* with Dumptor®

On the above operation, Koehring Dumptor drives up to the hopper, body forward. Operator trips the body-release lever, and *gravity* tilts the 6-yard body 70 degrees. One second later the load is out, and Dumptor is on its way back for the next load. Because there is no waiting for slow-acting body hoists, *gravity-dumping* saves 15 to 25 seconds on every round trip. This adds up to a substantial increase in extra yards per hour. For instance — take a typical 1,000-foot haul, where you normally would make 16 trips an hour. By saving an average of 20 seconds dump-time on each trip, Dumptor gains 320 seconds, or 5.3 minutes more productive haul-time an hour. You get 17½ trips, instead of 16. This, alone, adds 9% to hourly production. What's more, there are no expensive hoist-replacement parts, or hoist maintenance time. *Gravity-dump* never wears out, never balks. You get the same one-second dumping *every time,* under heaviest loads, in all temperature extremes. Better check what this can mean in lower costs, and increased production on your hauling operations. Get the complete Dumptor story from your local Koehring distributor. *Call him today.*

Plenty of power on the haul – You get better than 6 h.p. for every ton of loaded weight when you haul with heavy-duty Dumptor. That's why it accelerates fast, pulls through soft ground, up ramps and grades with less shifting – climbs 24% grades fully loaded. When hauling heavy materials, extra horsepower means extra load-carrying capacity.

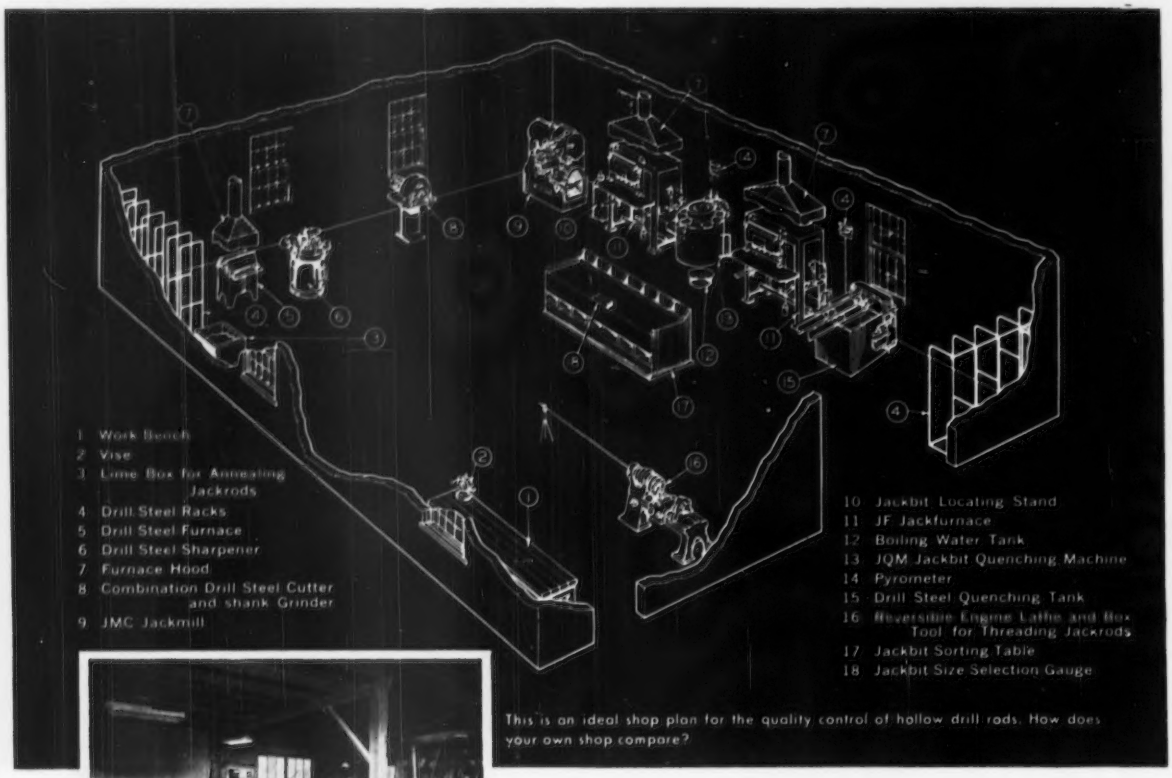
No-turn shuttle hauling – Dumptor solves problems of operating in tunnels, along overhead trestles, or narrow haul roads. There is no need to turn, because it travels with equal ease, power and speed in either direction. No-turn hauling offers a big production advantage, too. Every turn saved cuts 15 seconds off cycle time, increases output.

Easy-loading target – Big, 64 square-foot body opening permits loading Dumptor over the side or either end. This saves spotting time, reduces spillage. Heavy duty body is built for rock. Top edge and bottom are box-beam constructed. Sides and ends are rib-reinforced. In fact, Dumptor has a ton of strength for every ton of payload capacity.

Time-saver on stockpiling – Dumptor puts stockpiling on a fast shuttle-haul basis – eliminates turning on top of pile. Notice how instant dumping action kicks the load out over edge of pile – saves a lot of dozer clean-up. Free-swinging kick-out pan breaks load suction in wet, sticky materials, bolts down to floor when handling rock.

KOEHRING COMPANY, Milwaukee 16, Wis. Subsidiaries: PARSONS • KWIK-MIX • JOHNSON • KOEHRING-WATEROUS LTD.

how to get the most out of HOLLOW DRILL STEEL


1 Work Bench
2 Vise
3 Lime Box for Annealing Jackrods
4 Drill Steel Racks
5 Drill Steel Furnace
6 Drill Steel Sharpener
7 Furnace Hood
8 Combination Drill Steel Cutter and Shank Grinder
9 JMC Jackmill
10 Jackbit Locating Stand
11 JF Jackfurnace
12 Boiling Water Tank
13 JQM Jackbit Quenching Machine
14 Pyrometer
15 Drill Steel Quenching Tank
16 Reversible Engine Lathe and Box Tool for Threading Jackrods
17 Jackbit Sorting Table
18 Jackbit Size Selection Gauge

This is an ideal shop plan for the quality control of hollow drill rods. How does your own shop compare?

Typical on the job arrangement.

To bring you the best drill rods possible, manufacturers spend many thousands of dollars each year in development and testing. Crucible, for example, put more than half a hundred different alloys through their paces before CA DOUBLE DIAMOND and 4E Alloy Hollow Drill Rods proved the answer to lower cost drilling.

But to get the most out of modern drill steels, you've got to *maintain* their fine quality *after they reach your shop.*

The Answer is Quality Control

Unintentional abuse of drill steel by improper forging, machining, heat treating and other shop operations, produces a rod that is bound to give poor performance.

That's why full time supervision on operations such as these can mean longer drill life on the job:

1. Check heat treating process. Overlap heats for proper time.
2. Check furnace and forging temperatures.
3. Check annealing process to insure correct hardness.
4. Check Rockwell hardness of shanks and thread ends.
5. Check fit of bits on newly threaded rods.
6. Check location and severity of metallurgical notch.
7. Examine all rods returned from the job and determine reason for failure.

Shop control of this type actually saves money by eliminating many rod failures on the job. Personnel will be enthusiastic in reporting improved rod performance, and you'll be getting lower cost per foot of hole drilled.

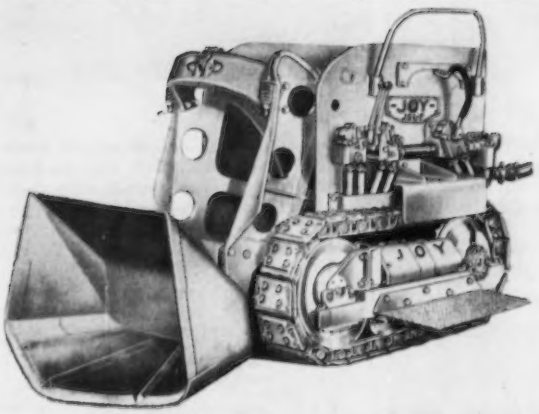
Your nearby Crucible representative will be glad to supply helpful information on other phases of drill rod care and operation – or arrange for *prompt* deliveries of hollow drill rods in the sizes, grades, and types you need. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

E&MJ NEW PRODUCTS DIGEST

James W. Franklin



Joy Offers Three Underground Mining Crawlers (1)

Air or electric powered for trackless hard rock mining, Joy Mfg. Co.'s three new extra heavy duty crawler-mounted machines can be equipped with a host of attachments.

Joy JMT-7 mining tractor has 12,080 lb drawbar pull. A 15 hp Joy PA-17 Pistonair motor or high-torque electrics drive each track. Tractor can be used as a fork truck, backhoe, scaler, jumbo, roof bolter or timber setter.

Joy JSL-7 shovel loader can load on slopes, in shafts, at draw points. It can be used as a transporter or can handle large boulders. Bucket is 11 cu ft. Same motor and drawbar power as on tractor. A 33 cu ft hopper can be added.

Joy JMD-7 mining dozer can be used to help the slusher, to keep draw points level or work on slopes. Same drawbar and motor characteristics as tractor. Basic tractor unit is 56 in. wide by 74.25 in. minimum height.

Wood's Sure-Flex Coupling Assembles Easily (2)

No covers, no flanges to tighten, no parts to bolt in place says T. C. Wood's Sons Co. in describing their flexible couplings that are available in six sizes for motors from 3- to 80 hp. Shaft bores are available from 5/8- to 2 1/4 in. Internal and external teeth on the flexible sleeves mate with the teeth in the hub flanges, locking tight under load without clamps or screws.

Elastic rubber sleeve allows for end play, parallel and angular misalignment. There are no rubbing or wearing surfaces. No need for lubrication.

Sure-Flex will handle angular misalignment up to one deg, and parallel misalignment of from 1/32 to 1/16 in., depending on shaft size. End float up to 1/8 in. is absorbed by Sure-Flex.

Industrial pH Handbook For Sale

Process Instruments Division, Beckman Instruments, Inc. just recently released an outstanding review of industrial pH control systems, their principles, their applications and equipment. Contains approximately 100 illustrations. Price $2. Write, send money, direct to manufacturer—Beckman Instruments, Inc., 2500 Fullerton Road, Fullerton, Calif.

Powered Industrial Truck Handbook For Sale

Handbook prepared by the Industrial Truck Association, Ninth and F Sts., Washington 4, D. C. is 96 pp. and covers these subjects—applications, cost-saving uses, planning for and selection of industrial truck, and engineering data. Industrial trucks are fork trucks, lift trucks, etc. This is not a free literature notice. Write, send money, direct to the Industrial Truck Association at the address above. Price $5.

Mine Ventilation Catalog (41)

ABC flexible ventilation tubing, brattice cloth and powder bags are described in American Brattice Cloth Corp.'s 24-page catalog. Typical mining installations are shown.

All About Belting—U. S. Rubber Handbook (40)

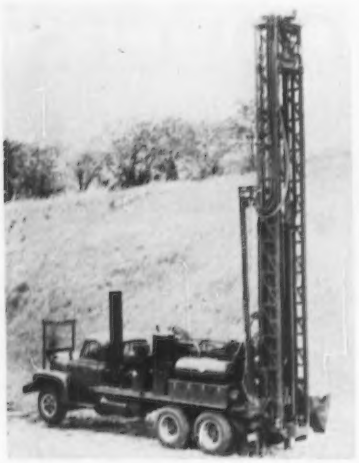
U. S. Rubber Co. has prepared an excellent 70-page handbook on belting for the metal mining industry. Booklet includes pit-to-preparation application, typical installation, how to select, how to insure a long belt life, preventive maintenance, and accident prevention. Check number on card.

Correction to Past New Products Announcements

In covering the Cannon Separator in Sept. *E&MJ* we incorrectly reported the name of the inventor. He is Harry B. Cannon. Also, Mr. Cannon reports that Union Carbide is installing 47 Cannon Separators on Amelia Island, Fla. beach sand deposit.

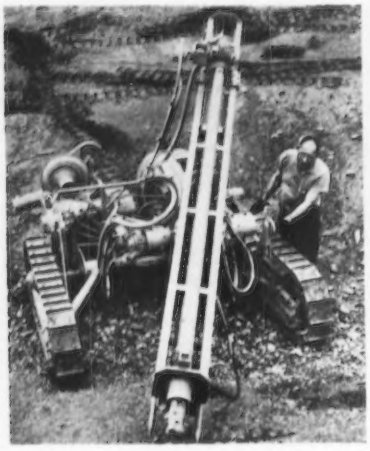
Cepi-American, Inc. (item No. 38, August *E&MJ*) reports that their boiler feed water treatment device is powered by high intensity permanent magnets that require no maintenance or replacement, instead of the electromagnets as we reported in the news item at that time.

New Products Digest is continued on pages 36, 39 and 40. For more information on these items and for new literature, use the card opposite p 42.



Rotary Drill (3)

Diesel-powered, truck-mounted rotary drill makes holes 600 to 700% faster than the best churn drilling techniques, according to Schramm, Inc. Mast is 30 ft high, with 25-ft travel for 20½-ft drill pipe. Schramm Rotadrill can drill to 700 ft with 4½-in. pipe.



Blast Hole Drill (4)

Built by Reich Bros. Mfg. Co., the 150 Blast Hole Driller is a self-propelled, crawler-mounted unit with 150-deg horizontal swing arc.

Rotary Drill (5)

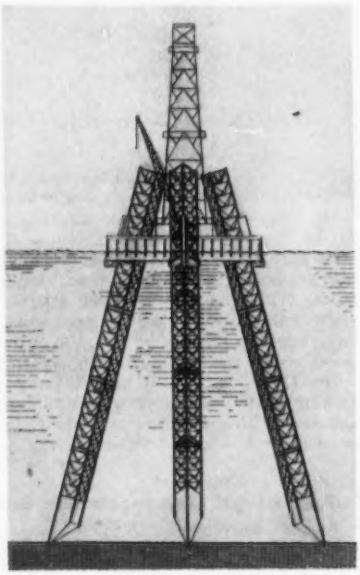
Horizontal "Weep Hole" drill developed by George E. Failing Co. can drill 4¼-in. horizontal holes to 300 ft.

Portable Dredge (9)

This little machine consists of a lightweight 4-cycle, air-cooled engine driving a rubber-lined sand pump to which is attached a gravel or nugget trap. Pump feeds fines onto a non-magnetic stainless steel sluice. Dredge can pick up from a stream through a 1-in. rubber hose fitted with a long narrow-pointed probe. Hose can be attached to the discharge side of the pump to wash down a gravel bank. Without hose and with a lightweight motor, the dredge weighs only 36 lb, according to Powermite Drill & Tool Co.

Immersion Electromotor (6)

Siemens-Schuchert has developed an immersion electromotor that works in drillings and mines under water. Water is used to cool the motor. In operation, the motor is directly shaft connected to the pump before the unit is lowered into the well.



Mobile Offshore Rig (7)

R. G. LeTourneau has designed a mobile drilling platform that permits working in waters up to 600 ft deep. Unit can be converted into permanent platform with ease. Most of the spud leg sections are carried on the platform and added when needed.

Boring Machine (10)

Horizontal boring machine Type GB 22 has caterpillar-type tracks and a flameproof 16kw electric motor. According to Salzgitter Maschinen AG, the machine drills up to 66-ft holes with 16-in. dia auger in potash ores at the rate of 10 in. per minute.

Republic Supply announces a new

MINE AND MILL SUPPLY STORE

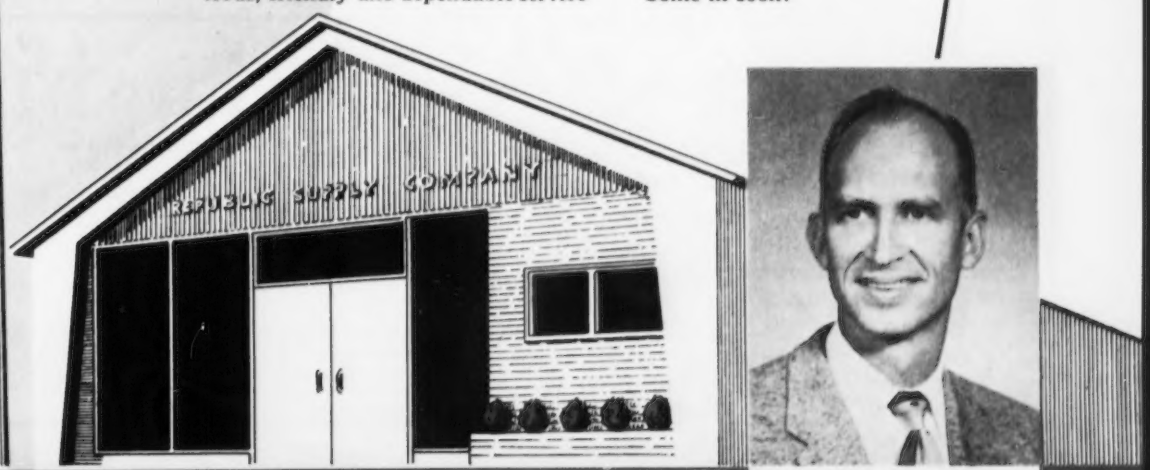
GRANTS, NEW MEXICO

The Flying "R" Spreads It's Wings

Republic Supply Company is pleased to announce the opening of a new store at Grants, New Mexico to serve the mining and milling industry. Grants is fast becoming the largest and most important uranium mining and milling center in the world.

For 47 years Republic Supply has been known as a leading supplier to the oil, gas and related industries. This leadership was gained by courteous, friendly and dependable service to our many friends. Republic Supply represents only leading, nationally known manufacturers — manufacturers known for highest quality products and fairness in business dealings.

You are invited to inspect our new store facilities and to meet our manager, Vic King. You will find him ready and able to help you on all your equipment and supply problems. Come in soon!

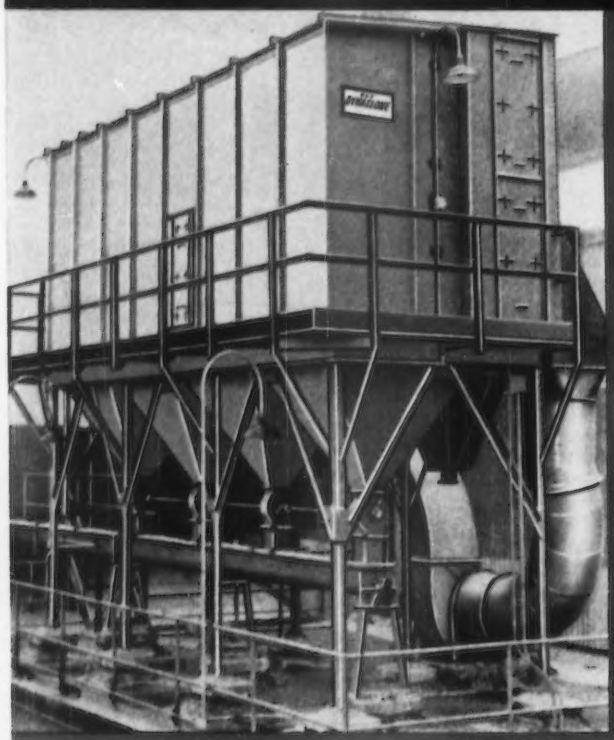


VICTOR A. KING
Manager

Republic Supply COMPANY

General Offices — Republic Building — Oklahoma City, Oklahoma

Now . . . a New High in Dust Filter Efficiency . . .



New SLY "ROLL-CLEAN" Dynaclone

Patent No. 2583039
Patent No. 2695681
Other Patents Pending

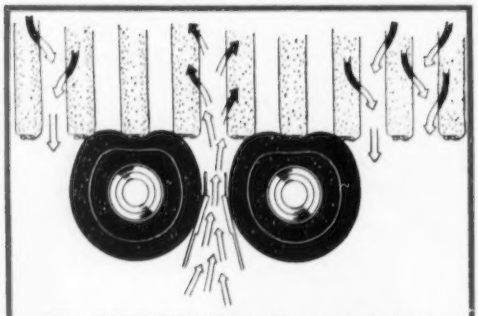
THESE NEW FIELD-PROVEN FEATURES

- Easier filter bag changing.
- Greater cloth area.
- Fewer operating parts.
- Free-rolling cleaner — no sliding.
- Complete dust seal — automatic seal adjustment.
- Easy access to all dust filter parts for inspection and servicing.

PLUS THESE TIME-TESTED DYNACLONE ADVANTAGES

- Constant suction at dust sources — complete dust collection.
- Self-cleaning for continuous operation.
- No auxiliary motors or blowers required for filter-bag cleaning.
- Greater filtering capacity and smaller space requirements — more cloth per cubic foot of filter than any other make.
- Lower power requirements.

The original self-cleaning dust filter, the Dynaclone has proven itself the most efficient dust filter ever made. The "Roll-Clean" Dynaclone combines design simplicity and rugged construction to insure even greater operating efficiency . . . even longer trouble-free service.



NEW "ROLLER CLEANER" provides greatly simplified method of cleaning dust from filter bags. Resilient rubber rolls automatically adjust to form a positive dust seal as each row of bags is cleaned by atmospheric air.

NEW CATALOG

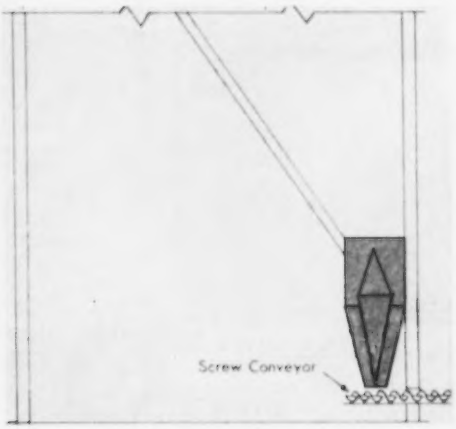
. . . gives full details on "Roll-Clean" Dynaclone and other Sly Dust Filters . . . contains valuable engineering information. Write for your copy.

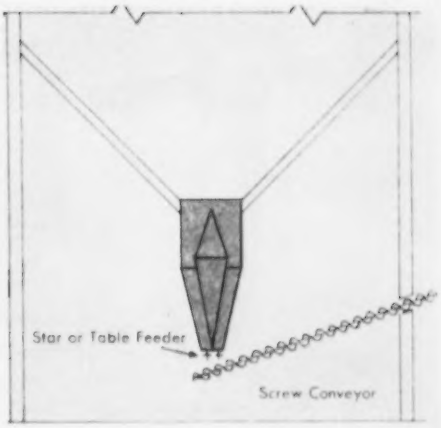
See it in Space 73, the Chemical Show, New York Coliseum, Dec. 2-6.

SINCE 1876 SLY

THE W. W. SLY MANUFACTURING CO.

4758 TRAIN AVENUE • CLEVELAND 1, OHIO
OFFICES IN PRINCIPAL CITIES





Bin Discharge Unit Developed by Bituminous Coal Research Inc. Handles Wet Fines (33)

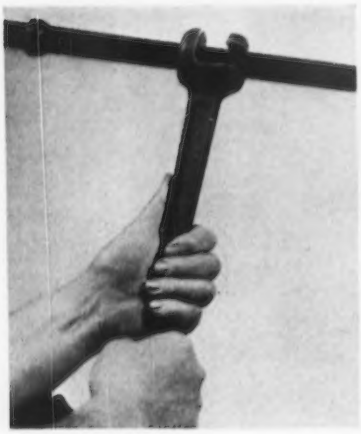
New bin-discharge device (patent pending), a development of Bituminous Coal Research, Inc., handles ¼xO coal with up to 15% surface moisture, provides reliable flow with coal sizes up to 3 in., permits gravity feed rates of up to 3½ tpm, and is usable with other bulk solids including sand. The "BCR Easy-Flo" also is said to eliminate flow stoppages, and contains no moving parts or vibrators. Low-pressure operation eliminates the need for expensive cut-off gates. The device, when added as a permanent part of a conventional bin, provides a means for controlling the flow of coal through a 3-ft opening in the bottom of the storage bin. Once the stored material passes by gravity from the bin into the discharge device, the double-cone arrangement maintains the material in an unpacked state. Gravity outflow through the 12-in. discharge opening of the device is assured because the forces acting on the material are controlled and conditions which are the causes of stoppages in conventional bins cannot develop. The setups in the accompanying illustration are typical applications for cylindrical bins. Suggested applications for other forms of bins will be supplied upon request to BCR. BCR has completed pilot-plant tests and is now building a full-scale bin.

WELCOME THE MAN WITH THE RED VALISE

Explosives Department HERCULES POWDER COMPANY INCORPORATED *900 Market Street, Wilmington 99, Delaware*

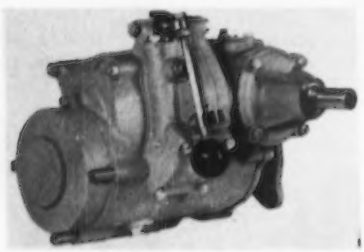
See Details in our Ad on Pages 134, 135

XR57-6



Steel Pull Wrench (8)

Steel pull wrench quickly frees stuck steel, thanks to a double-surface locking principle that makes it possible to pull and twist the steel at the same time. Patented wrench is available from Atlas Copco Eastern, Inc. Fits ⅞-in. hex steel.



Diesel Hand Starter (24)

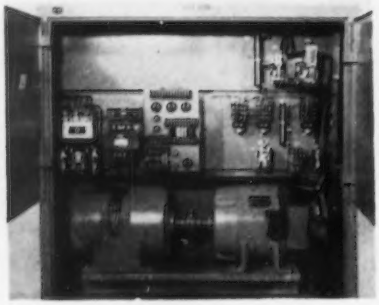
Inertia Starter Developments Ltd. says that their Model 14 Inertia Starter is adaptable to diesel engines up to 1.2 liter cylinder capacity without alteration or modification of engine design. Device eliminates the need for electrical starter, weighs only 73 lb. In operation, it requires no more effort than would be expected from the average man.

Silicon Rectifier (25)

Richardson-Allen Corp.'s rectifier gives 98% efficiency at full load. Outstanding features include—5% regulation with constant line voltage; 4.5% ripple over outside leg; dc output of 120/240v, 1000 amp, 3-wire; ac input of 208v, 60 cycle, 4-wire; and no moving parts.

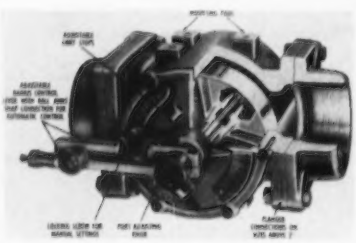
Gas Turbine Drive (26)

A 3250 hp gas turbine, used as a mechanical drive for pumps, compressors or generators, has been added to Westinghouse Electric Corp.'s line of gas turbines. Simple, open-cycle unit operates at 8500 rpm and any output speed can be had by proper gearing. At full load, the exhaust flow is approximately 191,000 lb/hour at 775 deg F. Unit measures 21x6 ft.



Speed Variators (27)

General Electric Co.'s packaged, adjustable speed drives are available in ratings from 3 to 150 hp and in speed ranges from 8 to 1 and higher. Designed for machinery where fine speed control is needed, the GE drives employ silicon rectifiers in the system.



Adjustable Port Valve (28)

Accurate control with low operating torque of air or gas flow at pressures up to 25 psig and temperatures up to 400 deg F are possible with the Hauck Mfg. Co. port valve. It is suitable for use with burners on kilns, ovens and driers.

Porcelain-Aluminum Signs (29)

Porcelain-on-aluminum signs for all purposes—trespass, danger, cage signal—are now available from Vikon Tile Corp. Signs won't rust, are flexible (see above), sturdy. Porcelain finish will not rust, chip or flake. Choice of 17 background and five lettering colors can be had. Aluminum nails come with signs.

What's New in Earthmoving

Hot water heater—for Caterpillar-built tractors. Can be used with D9, D8 and D4 Cats and are available in two types: recirculating and fresh air. Keeps the operator in the cab warm. **(11)**

Front end loader—Thew Shovel Co. has a rubber-tired front end loader with 4-wheel drive and 1¾ yd bucket available. **(12)**

Backhoe—Massey-Harris Ferguson Industrial Division backhoe is available in two sizes; the 210 with 200 deg operating arc, and the 185 with conventional swing cylinder. **(13)**

Backhoe—Model WR-350 by Wain-Roy Corp. is designed for mounting on International-Harvester 300-350 tractors. **(14)**

Electric tree crushing monster—designed by R. G. LeTourneau, Inc. to clear forest and jungle for land use, the Electric Tree Crusher behaves much like a giant steam roller. It smashes down trees in a 20-ft wide swath, clearing an acre in 15 minutes. It can knock down oak trees, 12-ft dia. **(15)**

Crawler tractor—Oliver Corp.'s latest addition, OC-15, has four speeds forward to 5.6 mph. Drawbar horsepower is 75. **(16)**

Torque converter transmission—Buyers of LeTourneau-Westinghouse "B" Tournapulls now have a choice of transmissions. Either torque converter or conventional manual shift types can be had. A 335hp Turbocharged diesel engine is now standard equipment on LeT-W torque converter machines. **(18)**

Lowbed trailer—LaCrosse Trailer Corp. has a single-axle semi-trailer designed for the small operator or contractor. **(19)**

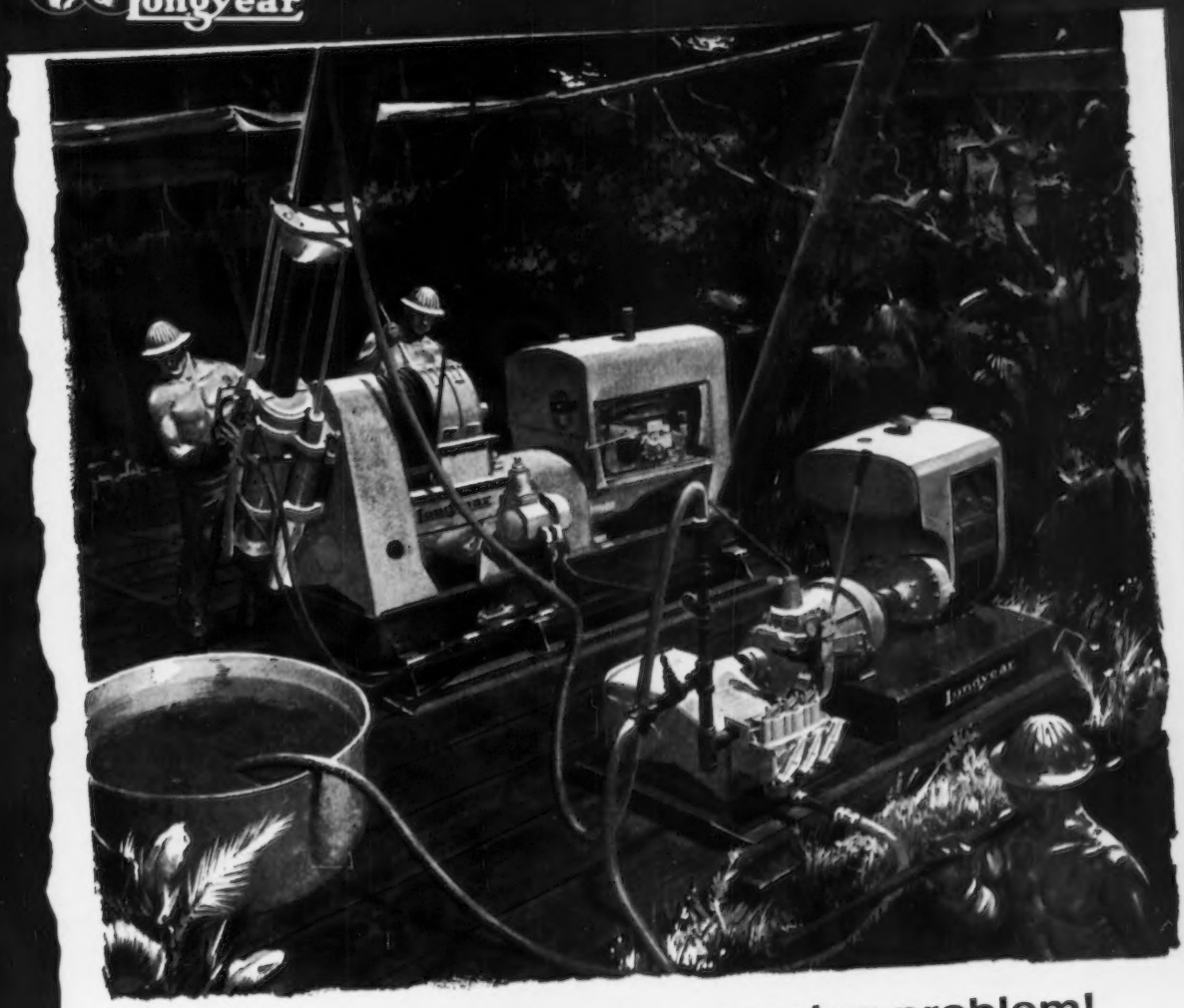
Battery-powered personnel carrier or utility truck developed by Kersey Mfg. Co., Inc. is safe for use in coal mines. Model PPC-9. **(20)**

Spark ignition electric set—Cat D375 is available with either self-regulating constant voltage or two-bearing generator. Rated at 160kw, according to Caterpillar Tractor Co. **(21)**

Joy-stick power controls are now available on the Lorain-26 crawler-mounted shovel, according to Thew Shovel Co. **(22)**

Underground skid-shovel designed by International Harvester is called the TD-6. Exhaust scrubber cools gases from the 55hp motor to 160 deg F, while dissolving out aldehydes. **(23)**

Longyear



The drill crew **without a pumping problem!**

They depend upon the versatility of a Longyear transmission pump

Today this drill crew started a new hole, pumping as much water as possible through a rock bit. Next week, or next month, they may be pumping 5 gpm at 400-500 psi and doing it *without bypassing . . . without throttling down . . . without changing liners . . . without changing pumps.* Rock bitting or fishtailing, coring at moderate depths or deep hole coring—their Longyear Transmission Pump satisfies *every* drilling condition.

Three Big Advantages

Because they selected a Longyear transmission pump, this drill crew has three important advantages. They:

1. Control pressure and vary water supply over a wide range by shifting gears.
2. Maintain proper engine speed to minimize carbon deposits, get maximum life from engine and pump.
3. Eliminate bypassing, can drill with a closed circuit.

Advantages of Closed Circuit Drilling

Closed circuit drilling permits the use of Longyear Wire Line or "L" series core barrels equipped with water shut off valve.

The instant a block occurs, increased pump pressure followed by discharge of water through the relief valve alerts the operator. This minimizes the chance of human error in detecting a block, substantially increasing core recovery.

The crew knows that the water is reaching the bit instead of escaping through a bypass—and bit costs are reduced. Fishing jobs brought about by burned or mudded bits are virtually eliminated. This one feature can more than pay for the pump.

Shown in the drilling scene above is the Longyear 535RQ Pumping Unit. Featuring a five-speed transmission, this unit pumps as much as 35 gpm, as little as 4.5 gpm at pressures up to 500 psi. Gasoline powered—also available with Diesel or electric power.

A Longyear Pump For Every Need

Experience has shown that you can't overestimate the importance of *selecting the proper pump for the job.*

Longyear offers a complete line of pumping units for every drilling need. We will be happy to send you full information on our entire line of transmission and single-speed pumps.

E. J. Longyear Company, MINNEAPOLIS 2, MINN.

CANADIAN LONGYEAR LTD., NORTH BAY, ONTARIO • LONGYEAR ET CIE., PARIS, FRANCE
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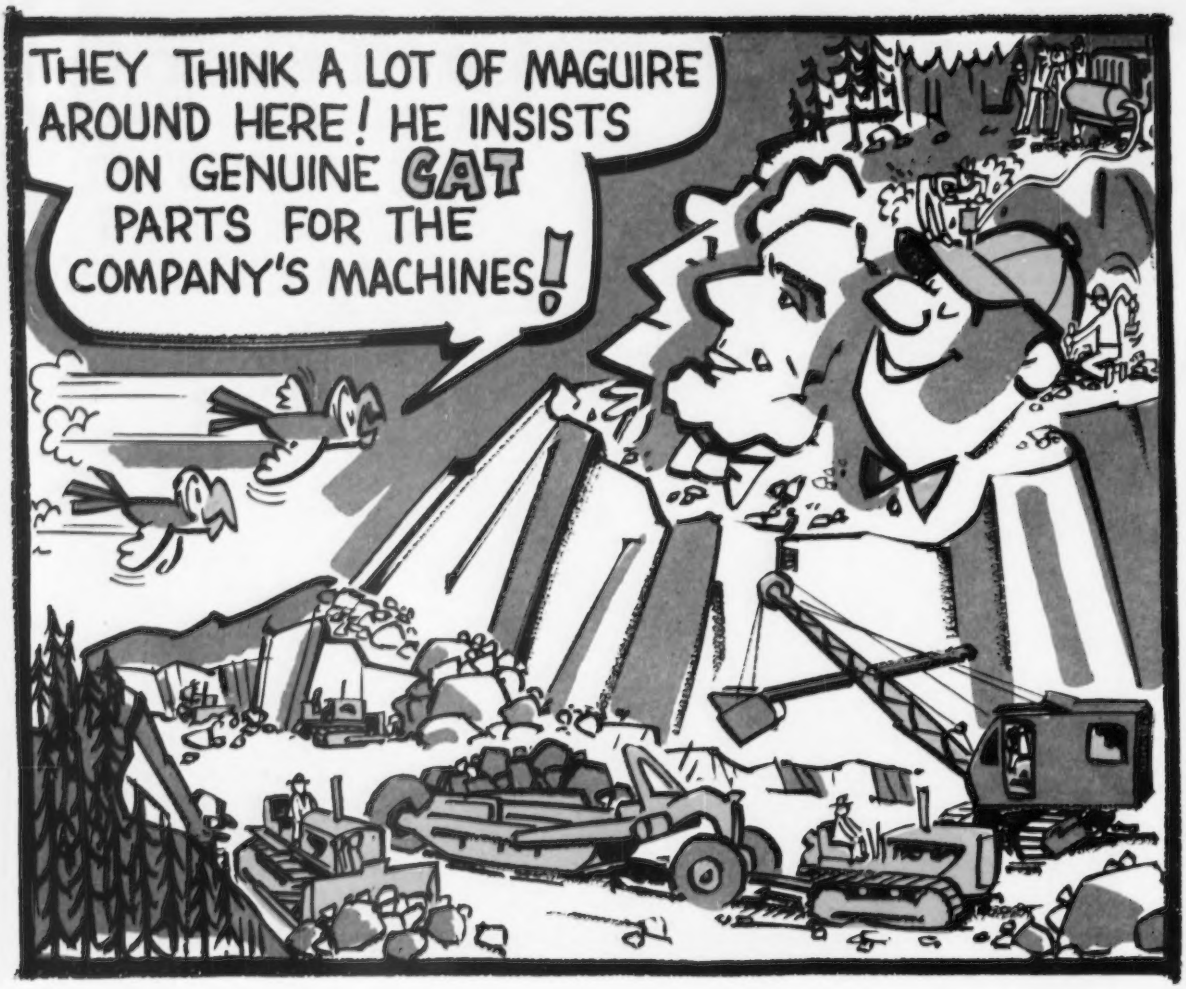

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This selected manufacturers' literature is free unless otherwise specified. If item is for sale, send request and money direct to manufacturer.

Exploration and Mining

MAINTENANCE GUIDE, a 24-page bulletin prepared by Caterpillar Tractor Co., contains more than 75 full-color drawings of helpful hints for obtaining optimum service from Caterpillar-built equipment. **(80)**

DEVELOPMENT AND USE OF CORE BARRELS IN DIAMOND DRILLING is the title of an 8-page bulletin produced by E. J. Longyear Co. Booklet includes information on seven types of barrels. **(81)**

DRILL BIT GRINDING is discussed in Bay State Abrasive Products Co.'s latest 6-page brochure. When and how to grind and how to select grinding wheels are covered. **(82)**

PORTABLE AIR COMPRESSORS are the subject of Le Roi Div., Westinghouse Air Brake Co.'s 8-page bulletin, CG-15. Both reciprocating and rotary units in the Tractair line are covered. **(83)**

BACKHOE CATALOG from Hyster Co. is 16 pp. It features design and performance of the Hyster D4 Hydraulic Backhoe. **(84)**

TRACTOR SHOVEL bulletin published by Yale & Towne details their 1¼ cu yd Model 104 tractor shovel. Complete specifications are given. **(85)**

TERRATRAC CRAWLERS with power-angling dozer blade for 80 and 100hp crawler-tractors are covered in detail in J. I. Case Co.'s latest 8-page release. **(86)**

Auxiliary Equipment

CATALYTIC EXHAUST PURIFIERS for oxidizing carbon monoxide, fumes and odors from gasoline, LP-gas and diesel-powered equipment are illustrated in 4-page folder provided by Oxy-Catalyst, Inc. **(87)**

V-BELTS for machine and process power and how they're produced is the subject of Goodyear Tire & Rubber Co.'s 14-page booklet. **(88)**

PARA-FLEX COUPLINGS, by Dodge Manufacturing Corp., are described in 12-page bulletin. **(89)**

GEARED FLEXIBLE COUPLINGS in the Link-Belt Co. line are illustrated in a 12-page publication containing details, application and selection data. **(90)**

VALVES, in the Fairbanks Co. line, are covered in detail in the company's 136-page hard cover catalog. **(91)**

PRESSURE REGULATORS from Crane Co. can be examined in 6-page folder now available. **(92)**

STAINLESS STEEL CHART prepared by Peter A. Frasse & Co., Inc. sets down Government specifications for stainless steels on both sides of a hard file card. **(93)**

Metal and Mineral Processing

KREBS CYCLONES are fully displayed and detailed in Equipment Engineers Inc.'s two-color, 15-page bulletin. Operating data for many ore dressing jobs are listed. **(94)**

AIRSTREAM CONVEYORS, the automatic answer to modern bulk handling problems according to Dracco Corp., are illustrated in two-color, 28-page bulletin No. 530. **(95)**

ZIRCONIUM AND HAFNIUM bulletin prepared by U. S. Industrial Chemicals Co. is 12 pp, contains details on process and use. **(96)**

DRAGON JAW CRUSHERS are displayed in Appareils Dragon's excellent 11-page bulletin. In French. **(97)**

ALLOYS prepared by Shieldalloy Corp. are fully detailed in the company's 18-page brochure covering chemical analysis of pure metals, master alloys and ferroalloys. **(98)**

ROTARY DRYERS AND COOLERS can be used as calciners, warm air dryers or direct heat dryers in direct or countercurrent fashion in the Louisville line of General American Transportation Corp., according to their 17-page bulletin No. 66. **(79)**

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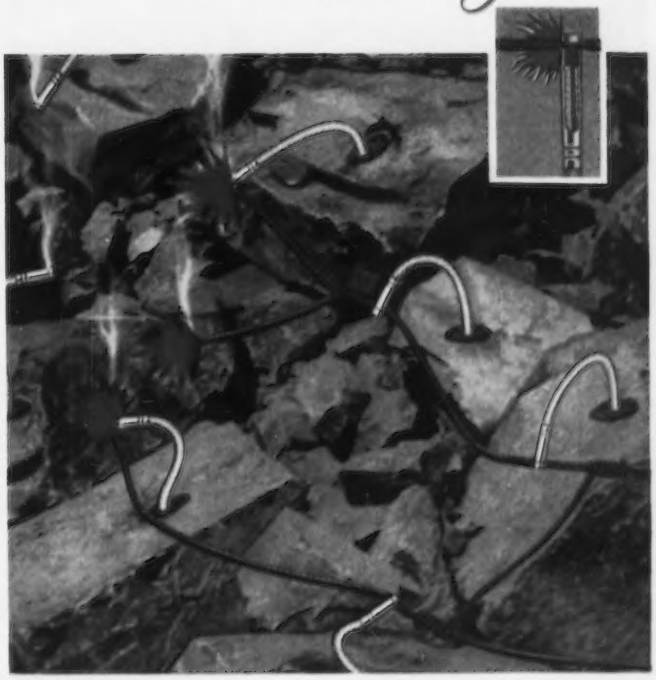

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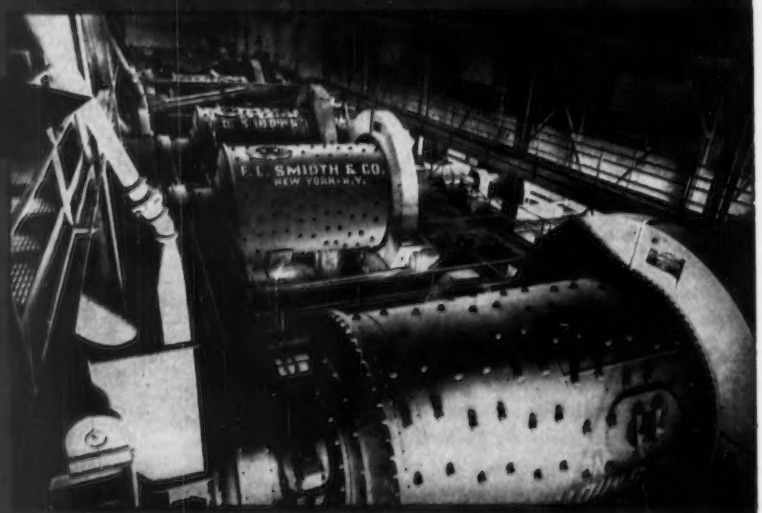

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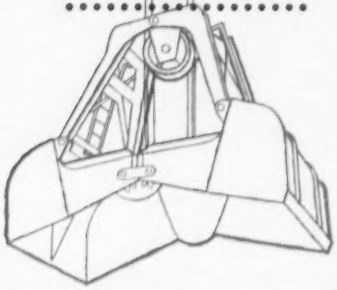

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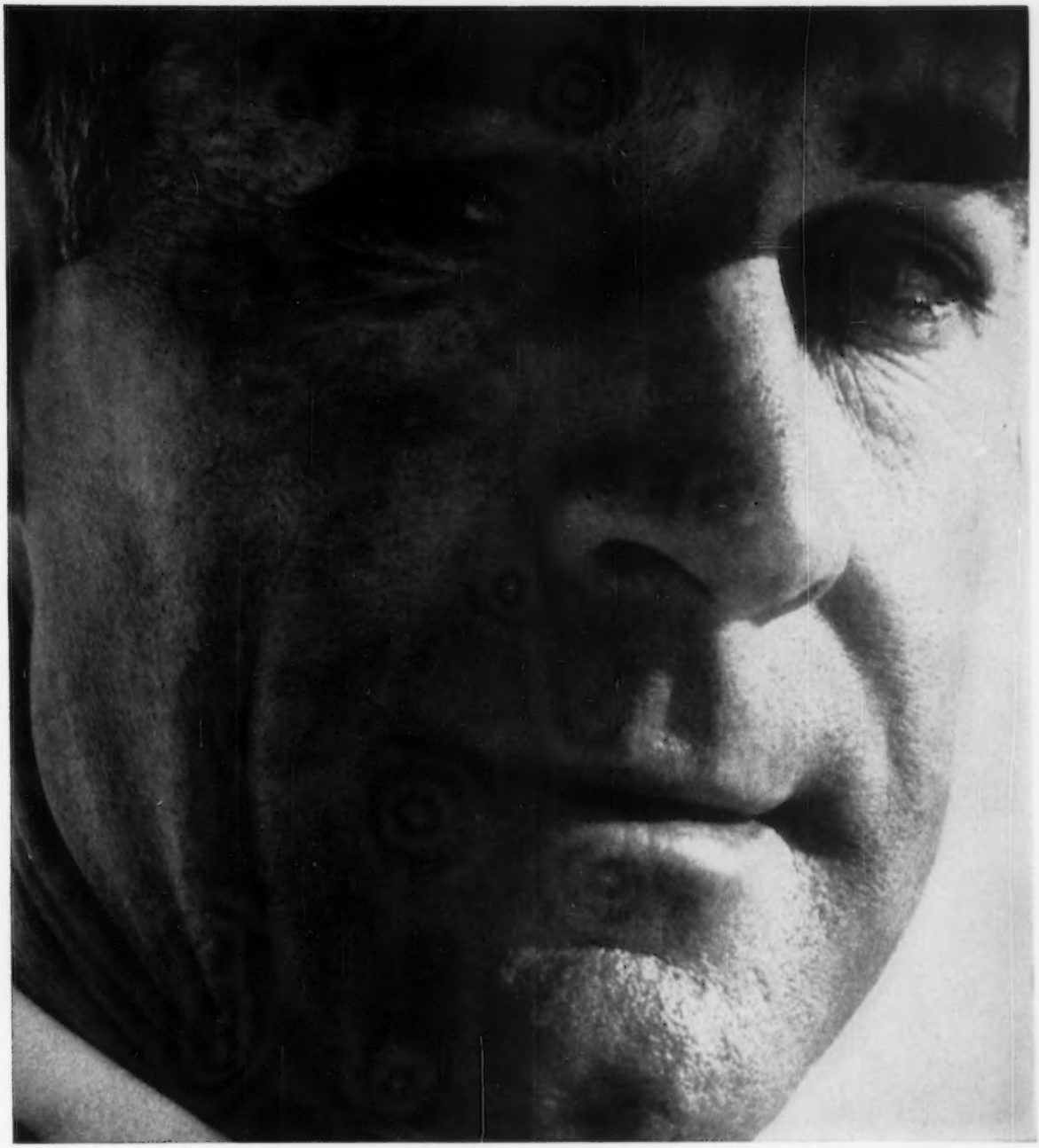

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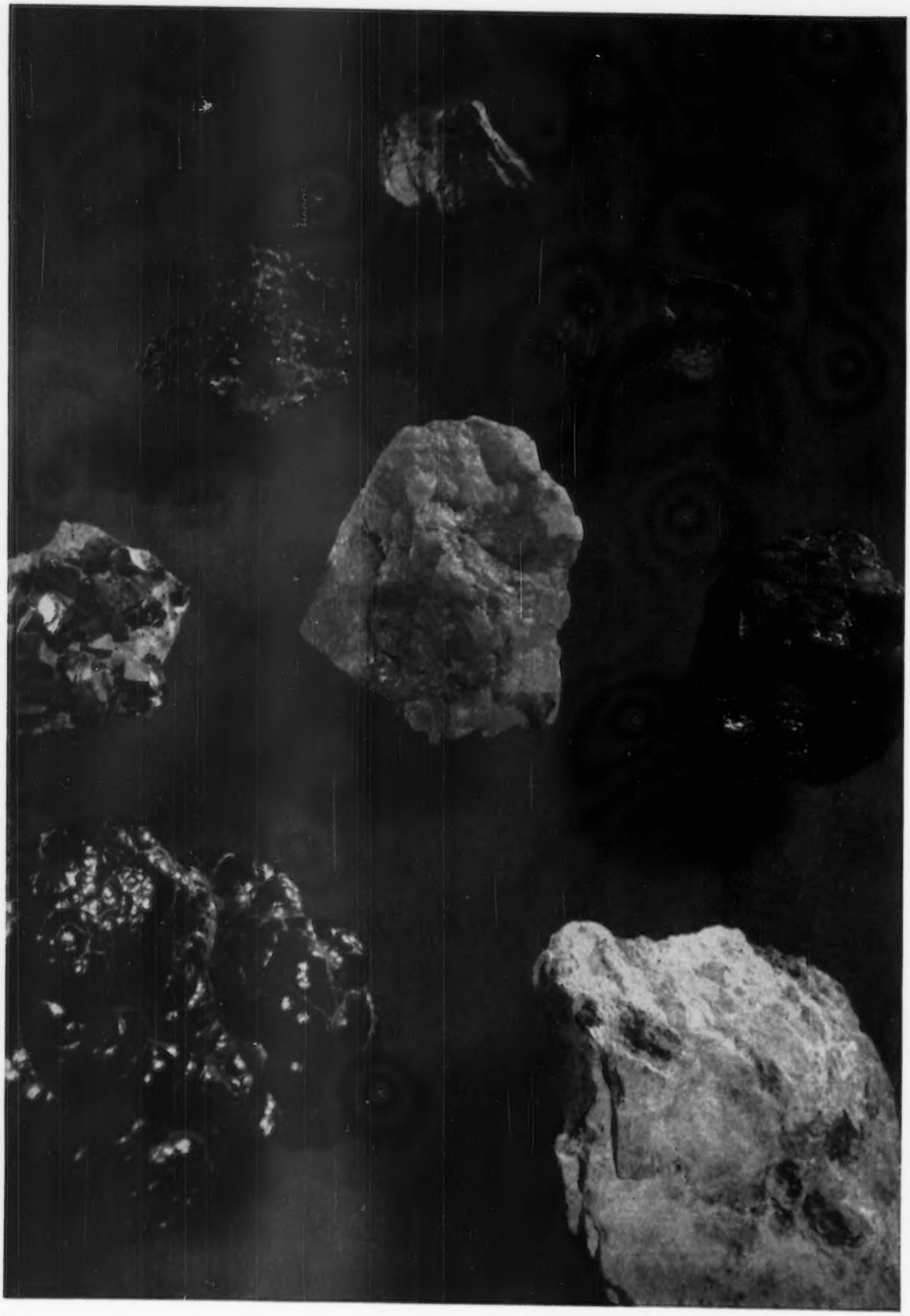

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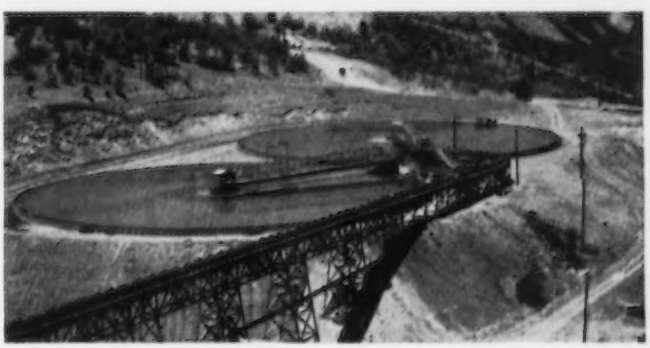

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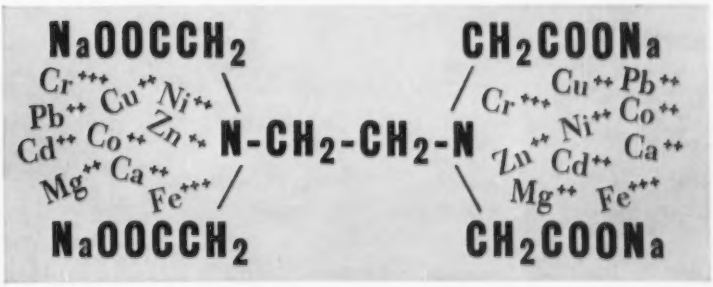

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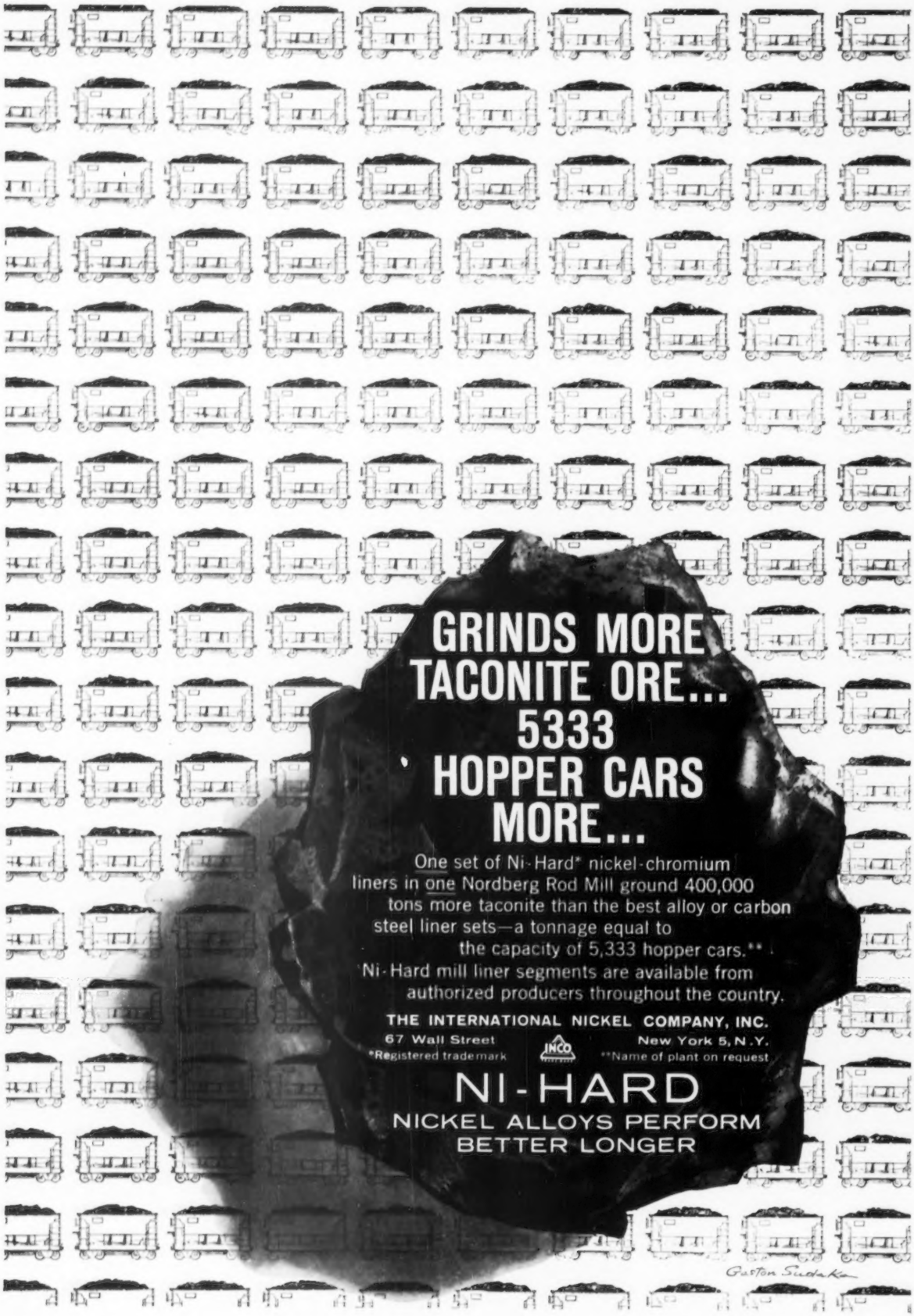
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WIDE HEADING CLEANUP WITH EIMCO 630 CRAWLER-EXCAVATORS IS FAST, ECONOMICAL AND EFFICIENT.

REDUCE THE COST SQUEEZE WITH EIMCO 630 TRACTOR-EXCAVATORS

With the "cost squeeze" tightening . . . you can use production savings offered by the Eimco 630 Tractor-Excavator to profitable advantage.

The 630 provides you features that pay-off in more production, operator efficiency and safety. Ruggedly constructed to withstand the severest operating conditions, the 630 insures against excessive down-time and costly maintenance.

Easy, convenient controls make the Eimco respond instantly to the operator's demands. In tough digging (with independent track reversal) he can maneuver the Eimco fast and sharp — from side to side — to cram the bucket without making a new approach. He can move the loaded bucket into overhead dump position while traveling.

Bulletin L-1039 will acquaint you with more Eimco 630 details. An Eimco Engineer will provide you with reliable production information.

THE EIMCO CORPORATION

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EIMCO

8-287

How to hold up a mine roof of sandstone and shale

Here in this Western coal mine haulageway is an outstanding example of Bethlehem Yieldable Arches at work. The overburden runs between 1450 and 1600 feet thick, and the material immediately surrounding the opening is soft shale and sandstone which, without support, would cave from sloughing.

In order to keep the haulway safe until the seam could be mined out, the mine operators installed Yieldable Arch sets on 2-ft centers, along with an unusually neat job of lagging. Because the Yieldable Arch is designed to "give" gradually, rather than break or let go, these sets helped to induce a natural arch in the overburden and bring peripheral forces into equilibrium.

Each Yieldable Arch set is made up of segmental U-shaped sections which nest together to form an overlapping joint. The joint is secured by heavy U-bolt clamps, thus providing the yieldability feature. The degree of yieldability is determined by the tightness with which the bolts are drawn up.

Yieldable Arches usually outlast timbers or other rigid supports. Because of this and their high recoverability, they can be counted upon to repay their original cost rapidly. Some mines have found that their Arches paid for themselves within six months! A Bethlehem engineer will gladly discuss roof-support with you in terms of your own particular problems. He can be reached through the nearest Bethlehem office.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
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BETHLEHEM YIELDABLE ARCH

BETHLEHEM STEEL

This Bucyrus-Erie 150-B is loading iron ore into end-dump trucks in a pit on the Mesabi Range.

CUT THE COSTS YOU CAN CONTROL
with Bucyrus-Erie Electric Shovels

The big capacity, rugged strength and long-life service built into Bucyurs-Erie electric shovels can help hold down digging and loading costs in your pit.

Years of service in every type of mine have proved the outstanding design features of these machines. Their sturdy front-end construction — with exclusive two-section boom, tubular dipper stick and twin dual hoist — provides plenty of strength, reduces deadweight, enables these shovels to handle big yardages economically. Bucyrus-Erie-improved Ward Leonard electric control provides fast acceleration and deceleration, extra torque and responsive power to speed work cycles. Strength and durability throughout assures efficient performance for profitable operations over a long period.

Let us give you complete information on these and other features of Bucyrus-Erie electric shovels and show you how they can help you control costs in your pit.

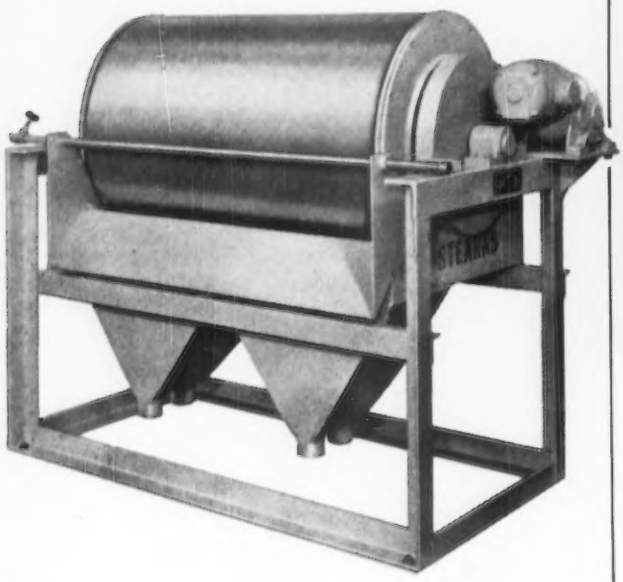
147L57C

A Familiar Sign... BUCYRUS ERIE *..at Scenes of Progress*

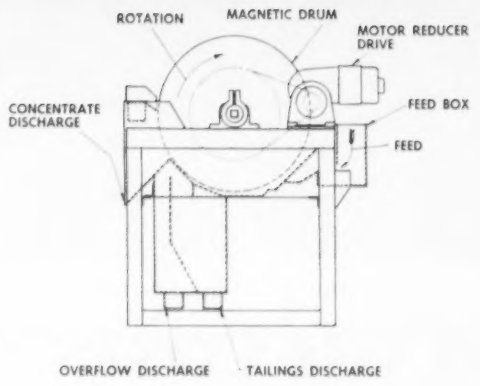
BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WISCONSIN

FOR CLEAN ORE—HIGH CAPACITY

Combine high-speed recovery with positive selectivity...



Specify STEARNS Magnetic Drum Separator



For cobbing or roughing of iron-bearing ores in big volume, rely on the Stearns WPD—a wet-type magnetic drum separator that offers truly outstanding efficiency. Here is a highly selective unit that can handle feeds up to 600 gpm of slurry containing particles from ⅜ in. down to fines.

The high recovery rate and low operating cost of the WPD assure speed and economy in performance not possible with other concentration equipment.

The powerful and dependable permanent magnet assembly produces a deep magnetic field with ideal flux distribution across the surface of the rotating drum. Positive and selective transportation of magnetic material produces a clean concentrate at the discharge.

Operation and maintenance require no special skills. One man can easily handle a multiple installation of Stearns separators, keep production at a high level with a minimum of attention.

The Stearns WPD magnetic drum separator is available in five drum widths from 15 in. to 75. in. Whatever your separation, purification or concentration problems, your Stearns representative will be pleased to help you select a separator that will give efficient performance and long service at low cost. See him soon, or write for Bulletin 2011-D.

STEARNS MAGNETIC PRODUCTS

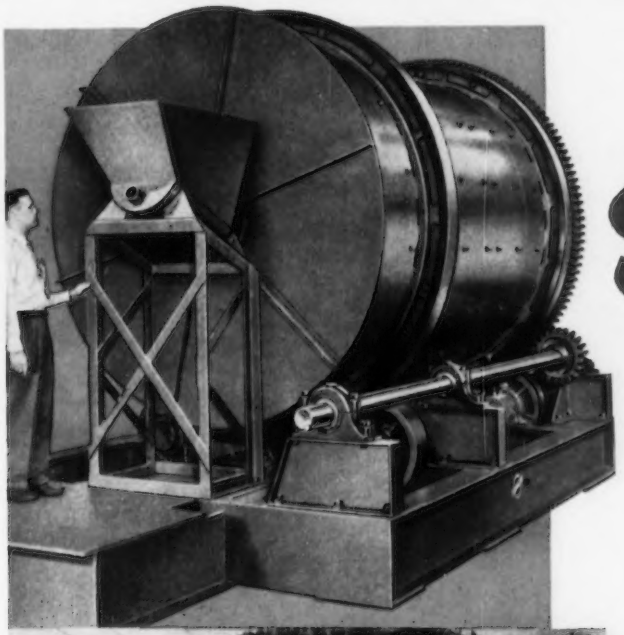
635 SOUTH 28TH STREET • MILWAUKEE 46, WISCONSIN

Specially designed ... cars of USS COR-TEN Steel

FOR CLEAN ORE—HIGH CAPACITY

TELSMITH

Super-Scrubbers®



high speed...terrific impact...grinding action much like a ball mill. Ore travels from feed to discharge end against clean water flowing in the opposite direction —emerges clean—with clay and dirt disintegrated and carried away by the water.

low cost installation, operation and up-keep. Economical of water and power. The Telsmith Super-Scrubber is made in four sizes: 60-inch to 96-inch; with capacities of 50 to 250 tons per hour. Send for descriptive Bulletin 266.

Philippine Islands—this mill of **Baguio Gold Mining Company** is equipped with a 60-inch Telsmith Super Scrubber.

Minnesota—in the custom mill of **Skubic Bros.**, Virginia, Minn., a 96-inch Telsmith Super Scrubber turns out remarkably clean ore at minimum cost.

Min. 38

SMITH ENGINEERING WORKS

502 E. CAPITOL DRIVE **MILWAUKEE 1, WISCONSIN**

Representatives in Principal Cities in All Parts of the World • Cable Address: Sengworks, Milwaukee

Specially designed cars of USS COR-TEN Steel to haul 25,000 cu. yds. of rock from Moffat Tunnel

These Granby-type automatic side dumping cars, specifically designed for tunnel work, are being used in the enlargement of the Moffat Tunnel pioneer bore at East Portal, Colorado. The tunnel, which will carry water from the western slope of the Rockies to the eastern slope and thence to Denver, is being cement lined and enlarged for a distance of 2½ miles. This will necessitate the removal of approximately 25,000 cu. yds. of rock.

The 3½-cu. yd. capacity cars, designed to operate in a tunnel of limited width, are constructed of ¼-in. COR-TEN Steel body plates and ⅜-in. COR-TEN Steel structural members.

These cars are not new. They have already been in service for over six years carrying rock and muck from other Colorado water tunnels. Yet, they are still in excellent condition despite their wet, rugged past. The reason is, of course, the USS COR-TEN Steel used in their construction. USS COR-TEN Steel offers 4 to 6 times as much resistance to atmospheric corrosion as carbon structural steel. Under conditions such as those encountered on this tunnel project, frequent alternate wetting and drying occurs, which accelerates the corrosion process. USS COR-TEN Steel's superiority in this respect is invaluable for this type of service. Moreover, it possesses the high strength needed to bear up under the daily pounding of heavy, abrasive rocks.

United States Steel produces three grades of USS High Strength Steel—COR-TEN, MAN-TEN and TRI-TEN "E." Each grade has its own special characteristics and each is recommended for certain end uses where it will give longer service and greater economy. Yield point of these three steels is 50% higher than that of carbon steel, and, in varying degrees, they offer greater resistance to wear, fatigue, abrasion and impact, and better resistance to atmospheric corrosion.

USS High Strength Steels are used to replace carbon steel in the vital parts of mine cars, dozers, shovels, drag lines and other such equipment to increase service life without increasing dead weight. Where the use of thinner sections is feasible, they can frequently (1) reduce equipment weight without reducing its strength, or (2) increase the size and capacity of equipment without increasing the total weight of the power needed to move it.

For further details on USS High Strength Steels, write to United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • NATIONAL TUBE DIVISION, PITTSBURGH
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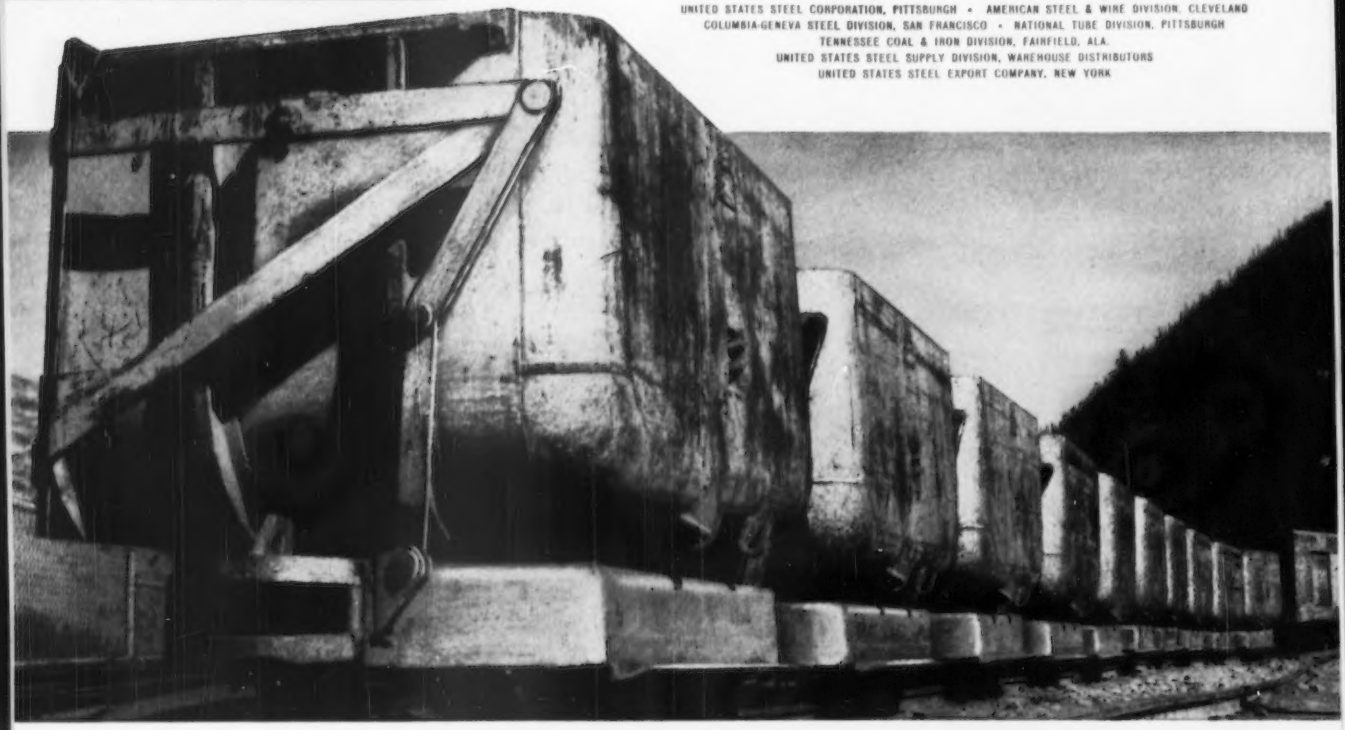
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



USS HIGH STRENGTH STEELS

USS MAN-TEN • USS COR-TEN • USS TRI-TEN

USS

UNITED STATES STEEL

A NEW Harbison-Walker Service-Proved Product

METALKASE XXP and XP

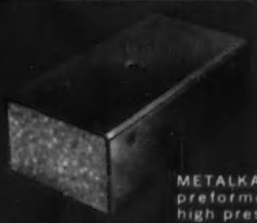
Steel Encased and Internally Plated Basic Brick Provide

- **greater spalling resistance**
- **reduced peeling tendency**

METALKASE XXP are chemically bonded basic brick with two internal plates, formed under high pressure, and are furnished in standard sizes, suspended arch and other shapes. They are available in various compositions. In the illustration the METALKASE XXP brick is cut to show the plated construction. These plates extend through the length of the brick.

METALKASE XP brick, having a single internal plate, are made in hard fired basic brick of various classes. They are available in standard sizes and many special shapes. These brick are used in various particular applications with great benefit.

Extensive use in service clearly demonstrates the superior spalling resistance of the internally plated brick, and as the result of improved stress relief, appreciably reduced tendency to peel.



METALKASE brick, preformed under high pressure and encased on all four contact sides by welding, in 22 gauge steel.

METALKASE brick with 3-sided steel enclosure, especially suited for electric furnace side walls and other specific applications.

Other Metalkase designs

HARBISON-WALKER REFRACTORIES COMPANY

AND SUBSIDIARIES GENERAL OFFICES: PITTSBURGH 22, PENNSYLVANIA

World's Most Complete Refractories Service

Users Say R/M BELTS AND HOSE

R/M Poly-V® Drive
More Power—Less Space!

Major causes of drive trouble are engineered *out* of R/M's patented new Poly-V* Drive. A single, endless V-ribbed belt running on specially designed sheaves gives Poly-V *twice* the tractive surface. Poly-V can deliver up to 50% *more* power in the *same* space as V-belt drives—*equal* power in 2/3 the space! This means *narrower* sheaves . . . *less* shaft overhang . . . *less* drive weight . . . *less* bearing load. Belt speed ratio and belt position remain constant under *all* loads to run smoother, cooler—with less wear on belt *and* sheaves!

Poly-V eliminates multiple-belt "length matching" problems, too. And just *two* cross sections of Poly-V Belt meet *every* requirement for heavy duty power transmission. An R/M representative will show you other features of Poly-V Drive that add up to longer, trouble-free service on your equipment.

Write for Bulletin #6638

*Poly-V is a registered Raybestos-Manhattan Trademark.

For the "Smoothest Running V-Belts Made," Specify CONDOR and R/M SUPER-POWER V-BELTS

Give You "*More Use per Dollar*"

HOMOFLEX HOSE
Reduces Hose Costs!

Because R/M engineering *increases* hose life! Homoflex Hose is light, yet strong . . . and "flexible as a rope." Mandrel-made with *no* pre-set twist . . . coils and uncoils in *any* direction—*without* kinking—without causing internal strain that can lead to hose rupture and failure. Homogeneous tube-to-cover bond is virtually inseparable. Uniform inside and outside diameters assure easy coupling . . . fuller, faster flow! Homoflex Hose does a *better* job and *lasts longer* . . . gives you "More Use per Dollar."

Write for Bulletin # 6879

RAY-MAN CONVEYOR BELT
Lasts Longer on Tough Hauls

Cushioned strength members . . . *double* compensation, top and bottom plies, relieves stress rounding pulleys. Strength *plus* flexibility permits peak loads, with natural troughing. Ray-Man requires no breaker strip . . . is practically rip-proof . . . *holds* fasteners . . . is mildew-proof and moisture resistant. Exclusive "XDC" Cover increases protection against wear, tears, cuts and abrasion. Check "More Use per Dollar" features of other R/M conveyor belts, too . . . Homocord for unusually abusive shock loading . . . R/M Tension Master for long lifts, high tensions.

Write for Bulletin # 6915

RM-714

BELTS • HOSE • ROLL COVERING • TANK LININGS • INDUSTRIAL RUBBER SPECIALTIES

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products: Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

You saw them first at the Road Show

Now the show is really on the road with big new Michigan Equipment!

375 hp moves 7 yard bladeful

Among the many big new Michigan Tractor Shovels, Scrapers, and Dozers now hard at work is this Model 380 Dozer. Photographed on a superhighway job in Michigan, the powerful rig moved more than 7 cubic yards of fill per pass. Power shift with 4 speeds forward and reverse greatly reduced normally-expected "deadhead" time. *Only from Michigan* could this contractor—or you—have a choice of 3 rubber-tire dozer sizes . . . Michigan now offers 375, 262 and 165 hp models.

27 yards without sideboards

On this Midwestern Super Highway, the Michigan Model 310 Tractor Scraper repeatedly hauled heaped loads of 27 pay yards. Its loading time averaged only 45 seconds. Material was sand and sandy clay. This Model Michigan features 375 hp and 4-speed power shift transmission with speeds up to 30 mph. It is the largest of three Michigan Scrapers now available . . . 10½, 18, 27 yards.

Power shift produces bonus yardage

Hauling 1,300 ft over rolling terrain typical of many jobs, this new 18-yard Michigan Tractor Scraper outproduced its also-new 18-yard competition, 198 to 146 pay yards per hour. Most of Michigan's 52-yard-per-hour advantage resulted from its power-shift 4-speed transmission *which enabled it to change gears without slowdown or loss of momentum* . . . a big advantage on this Detroit-area quarry stripping task with its varying, often steeply adverse haul grades.

Easy accessibility boosts work-time

At their open pit near Lost Hills, California, Holloway Gypsum Co. is using two Model 210 Michigans on work other rubber-tired scrapers could not perform successfully. All major components of these (and all other) Michigan Tractor Scrapers can be removed without disturbing adjacent parts . . . an important consideration on jobs like this where dust and desert heat hamper machines, and tight production schedules limit repair time.

Digs out, lifts, 4 yards per load

Powerful breakout, low-level tipback help new Michigan Model 275 Tractor Shovel consistently fill its 4 yard standard bucket for owner, Building Materials Inc, Torrington, Connecticut. Like all Michigans, the Model 275 features *all-Clark-built power train.* Components of this easily-accessible power train (and many other parts) are fully interchangeable between Tractor Shovels, Scrapers, and Dozers in the same series.

Two passes heap 14 yard truck

Records of this Florida quarry show load time for 14 yard trucks now *averages* 1½ minutes. Loading unit here is a big new Model 375 Michigan Tractor Shovel; standard SAE-rated bucket capacity, 6 *cubic yards.* Despite its size—10'4" high, 25'8" long, 62,000 lbs total weight—operation is as simple as on the smaller Michigans; with power steer, power shift, fingertip hydraulic bucket controls standard. R. H. Wright & Son, Fort Lauderdale, replaced *two* 2½ yard draglines with the *one* mobile Michigan.

Before I buy any new equipment, I'd like data on your Michigan

☐ Tractor Shovels: ☐ 2¾ yard, ☐ 4 yard, ☐ 6 yard

☐ Tractor Dozers: ☐ 165 hp, ☐ 262 hp, ☐ 375 hp

☐ Tractor Scrapers: ☐ 10½ yard, ☐ 18 yard, ☐ 27 yard

Name _____ Title _____

Company _____

Address _____

Type of Work _____

MAIL TO

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CLARK EQUIPMENT COMPANY
Construction Machinery Division
2465 Pipestone Road
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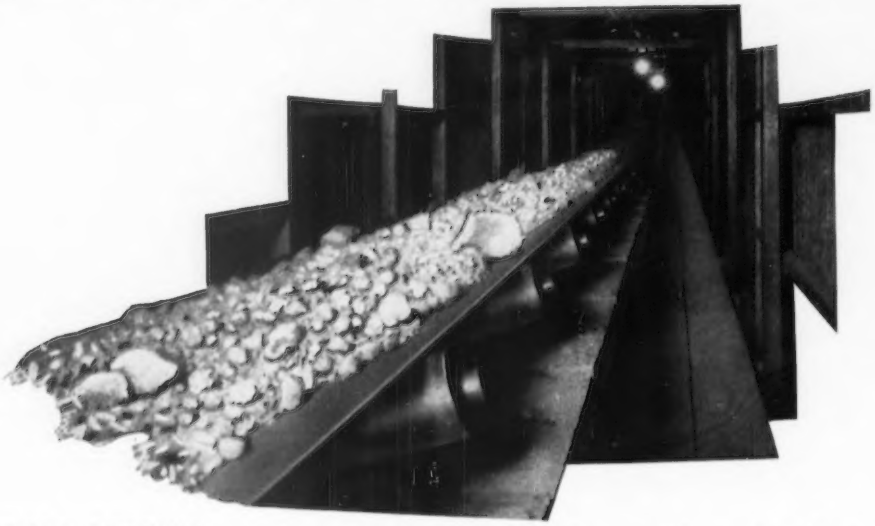
REVELATION AIR HOSE... for heavy-duty, high pressure service—extremely flexible... defies wear, abuse and abrasion.



CONVEYOR BELTING... whatever the job, Hamilton will supply the proper belt for your needs... and you'll get longer service life, too.

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MANUFACTURING CORPORATION • Trenton 3, N. J.

A Division of Acme-Hamilton Manufacturing Corporation

ATLANTA • CHICAGO • HOUSTON • PITTSBURGH • INDIANAPOLIS • LOS ANGELES • NEW YORK • SAN FRANCISCO

Why Wyandotte Chemical Corp. chose this dozer *(a Michigan)*

"Like most quarries, we have a lot of widely-scattered, repetitive jobs to do," writes William Hagen, veteran manager of Wyandotte's big Alpena, Michigan, limestone quarry. "Trouble was, our crawler-dozers just couldn't handle 'em efficiently—moving, as they must over rocky surfaces, at only a couple of miles per hour. And the cost of track maintenance was pretty awful. Major cause of track wear is travel, of course . . . so we tried to limit *both* as much as possible by putting a crawler on each operating level and another on the stockpiles. Didn't help much, though. Breakdowns would still upset our schedules *several days per week*. So we decided to look at some rubber-tire dozers." They tried one type. It was unsatisfactory. Then Wyandotte's local Michigan Distributor, Michigan Machinery & Equipment Co., arranged an on-the-job demonstration.

Makes hour crawler move in 7 minutes

"From the moment our trial Michigan drove off the flatcar, it was *busy*," Hagen continues. "First job on the docket was leveling a dump area on our macadam storage pile. The Model 180 dozed enough area to last an 8-hour shift —in only 28 minutes! Then, because *two* of our crawlers were down for repairs that day, we drove the Michigan a mile to our shovel loading area. *In less than 4 minutes* it was at work, cleaning up ahead of the 6 yard electric shovel and opening the way for trucks. Half an hour later, we moved back to macadam storage —a 3-minute trip this time. One of our crawlers would have taken a whole hour for the 2 mile round trip alone! Later, the Michigan assisted in moving our big quarry shovel; transfer of the power feed cable and area cleanup were handled faster than ever before. We also used the Model 180 Dozer to move drilling machines, air compressors and shanties . . . to strip shallow overburden . . . clean around the surge bin . . . maintain roads . . . and to level the flux stone stockpile. Nowhere in these operations did the Michigan have a bit of trouble. With performance like *this*, we were sold!"

Only 1 repair job in 5,800 hours

Hagen finds their Michigan today does all of these tasks and many more around this 450-acre quarry. The Model 180 actually works 16 hours a day, 7 days per week. Quarry Superintendent B. C. Raymond estimates its tire wear to be *1/6 as costly* as track maintenance on the crawlers. Its mechanical efficiency has been excellent . . . in the past year, it has been down for repairs *only once*. Operators say "Michigan drives like a new car . . . avoids constant jarring of a crawler . . . gets us on the spot *fast* . . . has fine visibility fore and aft. *We like it!*"

Want to move in on bottlenecks too?

We'll bet a Michigan Dozer can break production bottlenecks for *you*, too. Won't cost you a cent to find out—your local Michigan Distributor will be glad to arrange a thorough demonstration. You pick the time. You pick the job. No obligation, of course. And ask him about the popular Clark Lease-Purchase Plan, which lets you put a Michigan to work without investing a penny of capital. Other finance plans available—choose the one you like best!

Michigan is a registered trademark of

CLARK EQUIPMENT COMPANY
Construction Machinery Division
2465 Pipestone Road,
Benton Harbor 35, Michigan

In Canada: Canadian Clark, Ltd.,
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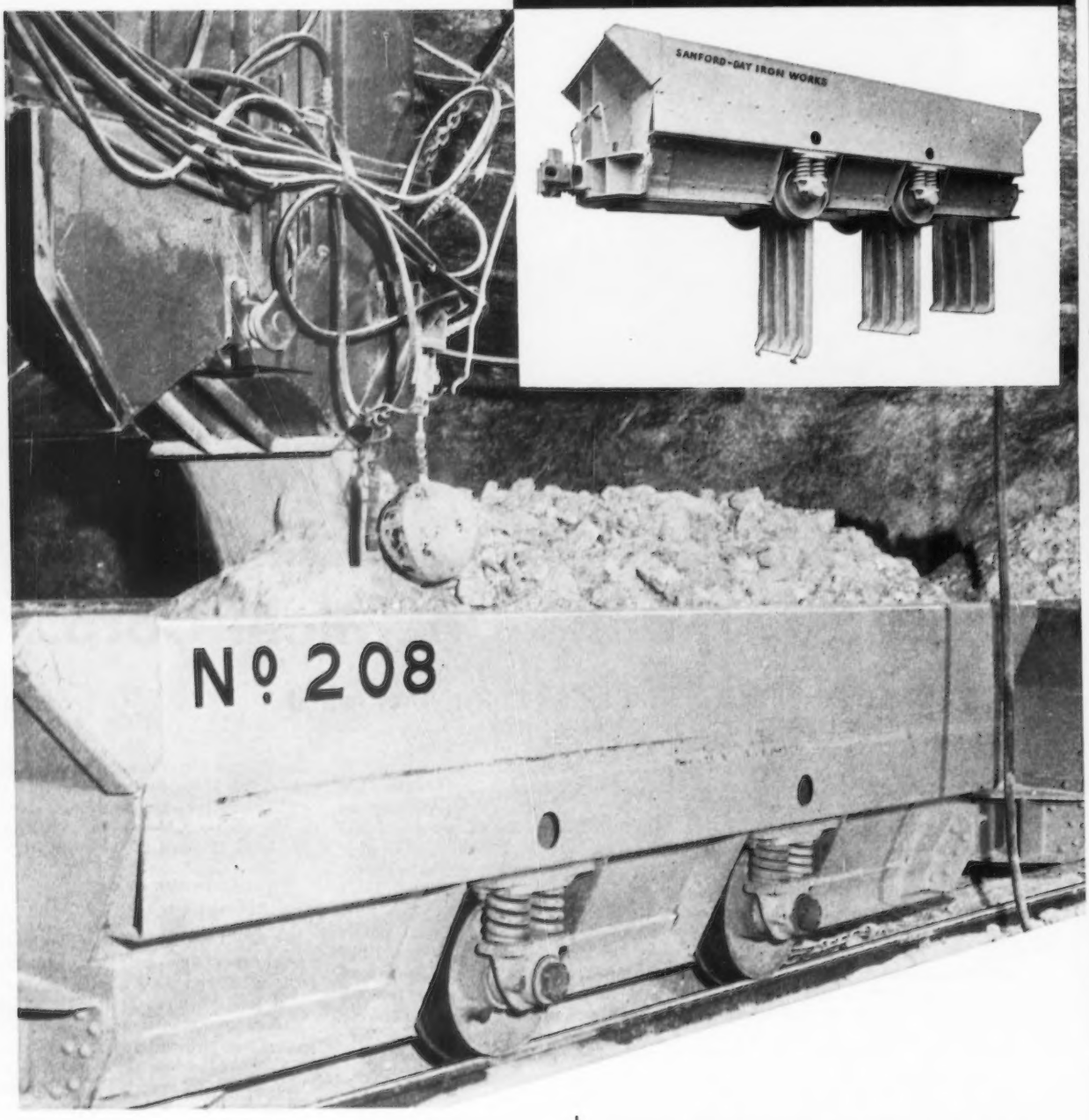
CLARK® EQUIPMENT

These S-D AUTOMATICS



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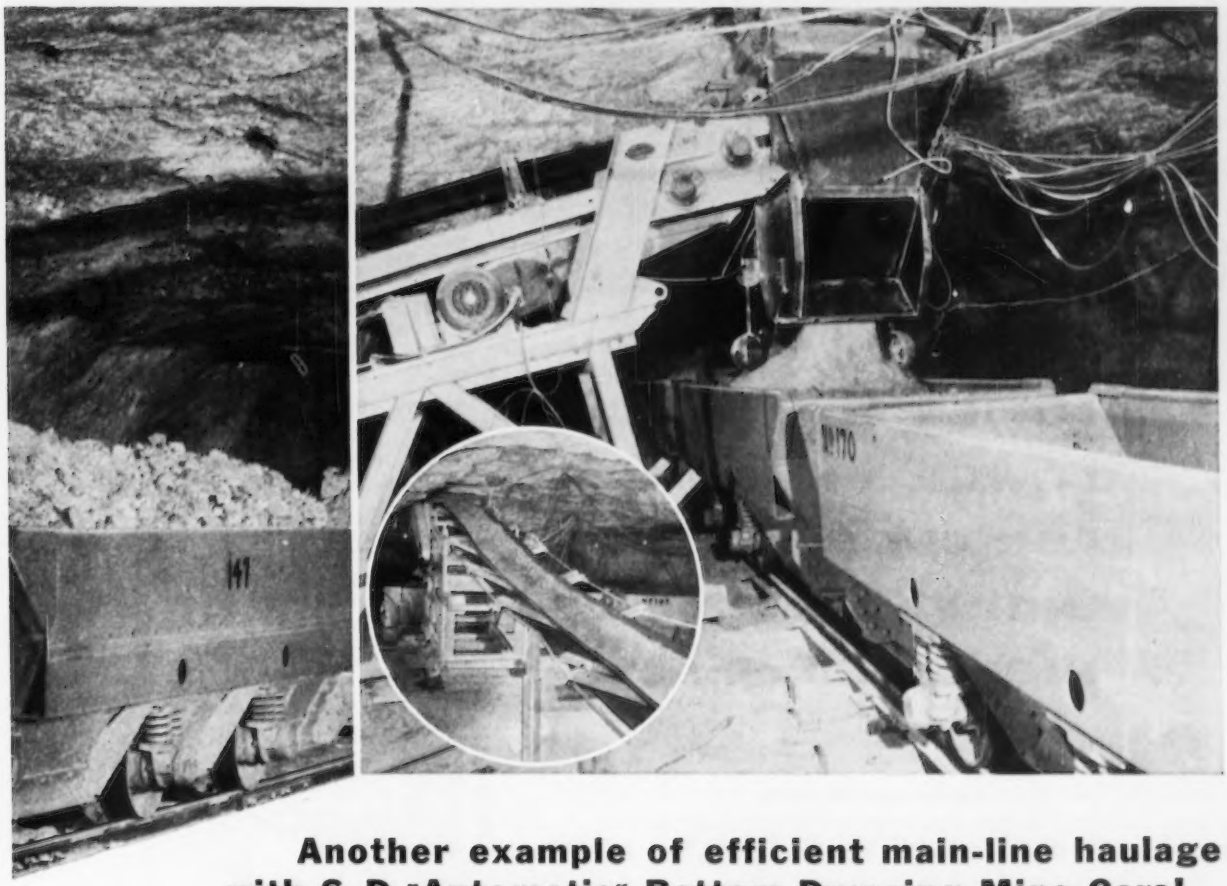
Knoxville, Tennessee

"SUPER MARKET FOR MINE CARS" — *all types* * PRECISION WHEELS * "BROWNIE" HOISTS, CAR RETARDERS, SPOTTERS, PUMPS AND OIL SPRAY SYSTEMS * GISMO SELF-LOADING TRANSPORT that loads *(mucks)* in development or production . . . transports . . . supports 2 to 5 jib mounted drills . . . back fills . . . moves boulder rocks . . . makes its own roadways and cleans up completely — a new method of hard rock mining offering a tremendous reduction in cost per ton!

have been in service at U. S. Potash 3 years...working 363 days per year, two shifts per day on a seven-mile run!



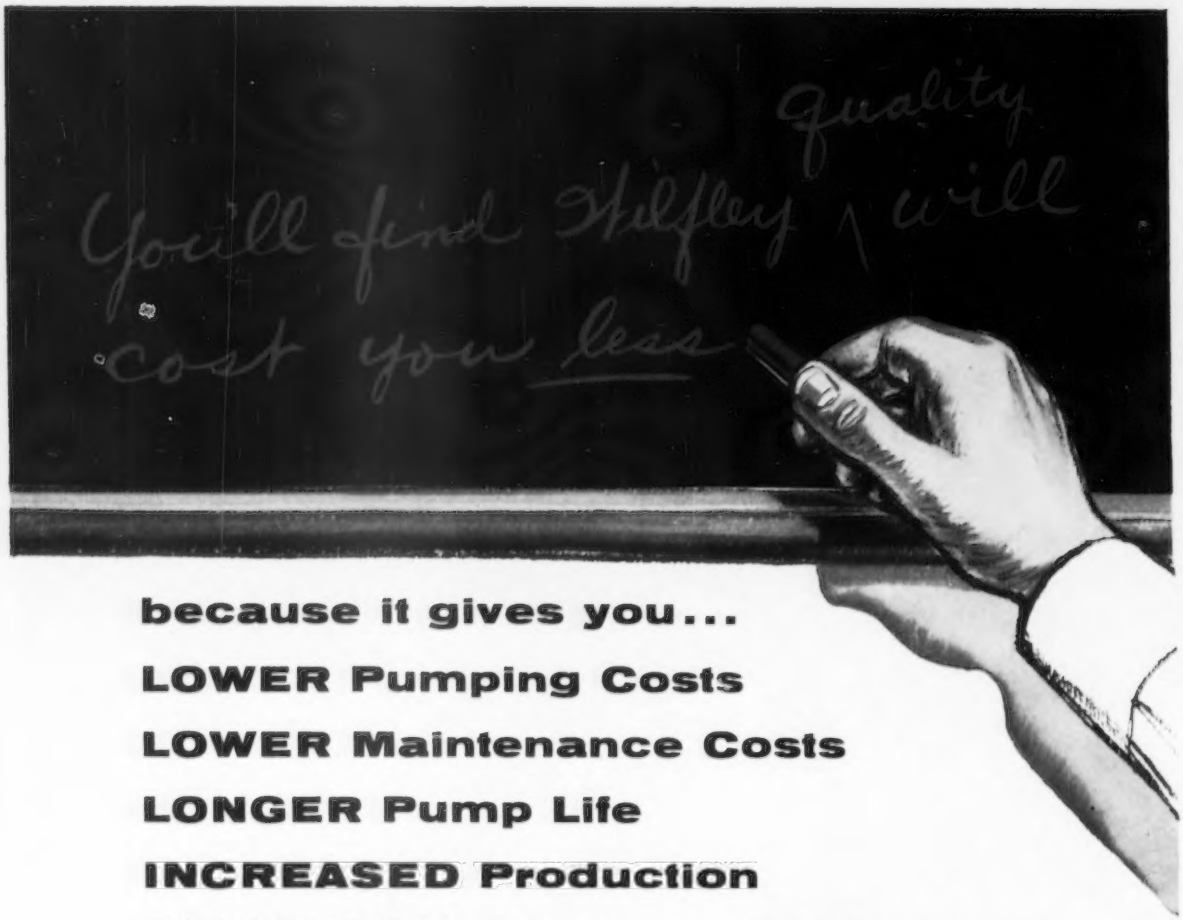
Another example of efficient main-line haulage with S-D "Automatic" Bottom Dumping Mine Cars!

"Because of their low center of gravity and balanced rugged construction, they hold the track exceptionally well at speeds up to 30-miles-per-hour," reports Mr. Earl H. Miller, resident manager of the Carlsbad, N. M., mining operation of United States Potash Company, Division of United States Borax & Chemical Corporation.

"Also," Mr. Miller continues, "the door operation is very good, allowing the cars to do a good job of self-cleaning." How does the maintenance costs of these cars compare with conventional type ore cars? "We have had very low maintenance costs on the S-D 'Automatics' compared to others we are using."

Note in pictures above and on page at left that mining management at U. S. Potash have further mechanized their main-line haulage with an automatic loading station. We are understandably proud that S-D "Automatics" were chosen for this U. S. Potash operation that incorporates the latest developments in modern simplicity and efficiency. In addition to this installation, S-D "Automatics," like the car illustrated at right, are hauling hard rock in several western mines at tremendous savings! Write us today for complete information. *Sanford-Day Iron Works, Inc., Knoxville, Tennessee*

1/4 to 1/2 TON MORE CAPACITY
Twin Latches FOR SAFE AND SURE LATCHING
SANFORD-DAY IRON WORKS
Safety Sealed AGAINST DUST LEAKAGE



because it gives you...

LOWER Pumping Costs

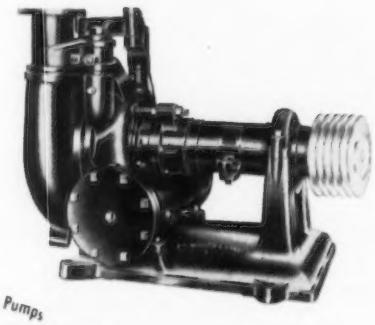
LOWER Maintenance Costs

LONGER Pump Life

INCREASED Production

HIGHER Efficiency

When you buy quality, Wilfley quality,
you buy *superior* performance.
You start *saving* money the moment a
Wilfley Sand Pump goes into action.
Let Wilfley solve your pumping problem.
Write, wire or phone.



Wilfley Sand Pumps
"Companions in Economical Operation"
Wilfley Acid Pumps

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SAND PUMPS

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ENGINEERING AND MINING JOURNAL

NOVEMBER 1957

"A New Kind of Prosperity"

"THE KEEN INTEREST of U. S. business firms in scientific research points the way to a new kind of prosperity for our economy — a prosperity based on deliberate creativeness." For elaboration of this stimulating observation, see McGraw-Hill's editorial which starts on p 242.

Then in Dexter Keezer's "Business Outlook for 1958," p 98, you will find a related statement — "Next year more money will be spent on research and the development of new products than in any year in our history."

Now why all the emphasis on research and development, particularly at this time? Perhaps it is because we are moving out of a period of serious shortages and into one of abundance — not only of raw materials, but of manufacturing capacity as well. The current temporary surfeit of metals would indicate this. If so, now is a good time to consider the stimulus that research and development can give sagging markets.

Nickel marketing provides a good example for study, because nickel will be one of the last of the major metals to come into comfortable supply since the Korean emergency. Ever since nickel producers in the Sudbury area of Canada united to form International Nickel Co. in 1902, research has provided important outlets for the metal and has underwritten the prosperity of the industry. Inco has spent millions on research and product development, and today employs a staff of about 825 men for this purpose.

Looking ahead, Inco is opening up the $175-million Thompson-Moak Lake project in Manitoba which, by late 1960, will have the capacity to add some 75-million lb of nickel annually to world supplies. (See p 73) At a spike-driving ceremony late in October, Inco revealed to the press and officials of Canada what some of its objectives at Moak-Thompson Lake were. And as we watched Premier Douglas Campbell, of Manitoba, drive the last spike in the railroad spur to the property, we couldn't help but reflect that he was driving home something vastly more significant than a symbolic nickel spike.

That spike meant that with Thompson-Moak Lake production, Free World output of nickel, (which was about 427-million lb in 1955) will be boosted to an estimated 600- to 625-million lb by 1960. When we consider that the Free World civilian consumption was about 325-million lb for the year ended Sept. 30, 1956, it is evident that there can be no let-up on the research and development work that has brought nickel to its present status.

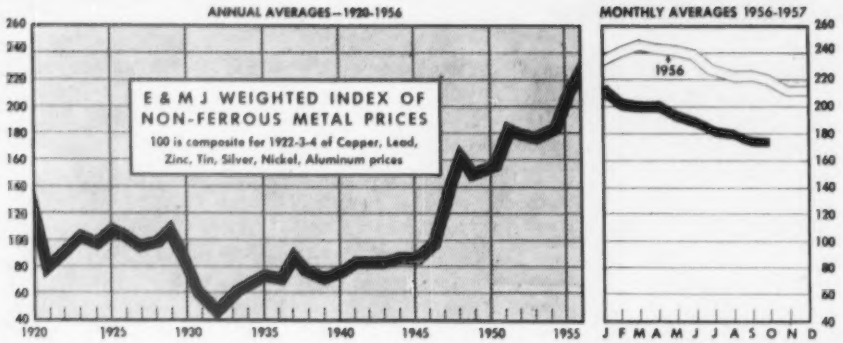
Inco's president, Henry S. Wingate, summed up the situation this way last December when the new project was announced: "It is evident that a huge demand must be provided to sustain the projected enlarged capacities of Inco and other nickel producers." He commented, therefore, "we are going forward energetically with our work of market development and research to stimulate the growth for future markets and uses for nickel," and expressed the hope that other producers would "not confine their efforts solely to the production of nickel, but would make a major contribution also by actively pursuing long-range research and development of uses and markets."

The concept of researching a metal into usefulness is not new, nor has its efficacy been questioned. One has only to review what Climax Molybdenum Co. did for the molybdenum market, what Reynolds Metals Co. has done for the aluminum market, and what New Jersey Zinc Co.'s work on high-purity zinc for die casting has done for the zinc market, to conclude that research and market development can lift a metal out of the doldrums.

The real question, on which there is considerable difference of opinion in the mining industry, is this: Is it the obligation of primary metal producers who share in a market to share in the development of that market? We believe that the McGraw-Hill editorial points out that research is not an obligation, but an opportunity.

E&MJ OUTLOOK

PRICES



MARKETS

Lower lead and tin price averages moved *E&MJ's* metal price index down slightly from 177.56 for September, to 176.223 for October. Buying interest in late October indicates that the metal price decline is "troughing out."

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AT HOME

Steel has definitely switched to a buyer's market, according to Roger M. Blough, chairman of U. S. Steel Co. He predicts that output in per cent of rated capacity for the first six months of 1958 will "range in the 70's." Steel capacity is expected to increase from 133.5-million tons for 1957, to 140-million tons for 1958.

Inventories of copper in the hands of users are "at dangerously low levels," according to Roy H. Glover, chairman of Anaconda. He predicts that the "adjustment period is coming to a close and that we will again, very shortly, return to the situation where sufficient production and not sufficient demand is the problem."

Ford Motor Co. looks for a 6-million-plus car year in 1958. Reason: Some 900,000 more credit contracts on cars will mature in 1958 than in 1957. With the old model paid off, more people should be looking at new ones.

Government Loan funds for minerals exploration have been hiked $4.8-million for the current fiscal year. Funds now total $38.8-million.

Interest in the direct reduction of iron ore is gaining momentum in the U. S. and abroad. High shipping rates are putting pressure on plans to take the oxygen out of the ore at the mine or concentrating plant, and ship the upgraded products to steel producing centers. Shorn dependence of the steel industry on capricious scrap prices is now in sight because of the new processes under development.

Economic weather vanes. Paperboard output for packaging is running at near capacity. This means that manufacturers must be planning to fill the packages. B. F. Goodrich expects replacement 1958 tire sales to top 1957 sales by 6%. With car wheels spinning at this rate, tetraethyl and replacement battery uses of lead should go up correspondingly. Number of FHA loan applications went up recently, possibly indicating stronger interest in future home building.

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LABOR

The Supreme Court is heading into a heavy season of labor cases. For some of the big issues in dispute, see p 137.

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ABROAD

Bids to establish rail transportation for Brazil's vast iron ore reserves transportation have come from Germany, Japan, U. S. and the government of Poland.

Latin America vies with Canada for strong iron ore position. See news items from Venezuela, p 144; Peru, p 214; and Colombia, p 218.

Polish geologists report discovery of a 6x25km copper-bearing area near Legnica, Poland.

International Minerals & Chemical Corp. plans to produce potash ore at a rate of about 720,000 tons per year by late 1959 from the Esterhazy deposit in southeastern Saskatchewan. Cost of the operation will be about $20-million. Expenditures for fiscal year ending July 1, 1958 will be about $3.5-million.

MARKETS

Copper Prices Steady, Sales Better; Lead Price Drops; Tin, Aluminum Weak

PRICES OF NONFERROUS METALS dropped further in October. The *E&MJ* weighted price index dropped to 176.22% of the 1922-24 average from 177.56 in Sept. The fall reflects the further decline in copper and the drop in lead and tin prices.

Copper prices were generally lower in October than September. In October the prompt bid high was £194, about 24.1c (on the second); in Sept. it was £202, about 25c (also on the second). The low in Oct. was £179 and the low in Sept. was £182. The monthly average in Oct. was about £7½ lower; almost one cent. The *E&MJ* Oct. foreign average was about a cent lower than Sept. The last week of Oct. London prices recovered about 1¼c; the afternoon session on the 31 prompt was about £193, but it fell about £5 on Nov. 1.

Most U. S. custom smelter copper was selling at 26c early in Oct. but by the middle of the month it was dropping and during the last half it was being sold in the U. S. at 25½c. Katanga dropped to 23.6c U. S. and Europe Oct. 15; it dropped again Oct. 24 to 23.15c but rose Oct. 31 to 23.8c. RST gave up its fixed price policy and early in the month began pricing its copper at the LME. Brandeis-Goldschmidt sold 500 tons to the Denver mint at under 25c delivered.

The drop in copper prices reflected the real situation in the copper markets. Consumers of fabricated products had dropped their use long ago and their demand had failed to pick up. Fabricators were convinced the heavy stocks of copper held by producers was a guarantee of sufficient supply of refined metal. Failure of product purchasing to rise led U. S. independent fabricators to keep their stocks of refined copper and products low (fabricating subsidiaries apparently have good stocks of products).

The partial recovery late in the month was influenced by stock market recovery, a spurt in buying by some fabricators with low stocks, rumors of labor trouble in Chile, expectation the U. S. Government would be taking more copper (the market price was lower than the price several firms could get under their stockpile contracts), and optimistic statements by some copper officials.

Statistics gave little encouragement. Copper Institute refined stocks for the world dropped by 5,683 short tons in September—but blister stocks rose 14,621 tons. Shipments to other than consumers—probably the U. S. government—rose to 8,606 tons. But deliveries in the U. S. to fabricators dropped to 102,925 tons, well under the 1957 average. Encouraging was the drop in world refined production—but crude primary output rose about 8,000 tons.

U. S. fabricating data for September were also not encouraging. Shipments dropped by nearly 4,000 tons and were under the 1957 average, sales dropped about 3,000; the only pleasant note was the drop of about 4,500 tons in stocks.

Reports of sales of refined copper for delivery in October by the copper statistical organization showed almost no change from the previous months; the sales for one month ahead are about 3,000 or 4,000 tons ahead of the comparable figures for earlier months.

The last U. K. fabricator data are for August—some observers found these data very discouraging since the copper content of fabricated production was the lowest of the year. But there is a sharp seasonal in these data—August is always the lowest month. A seasonally adjusted figure shows the August figures less discouraging. Stocks rose considerably but this is normal for late summer.

Reports of foregoing sales to *E&MJ* for October (data from which the foreign copper average is calculated) remained slightly under 100,000 tons but was a little better than September. There was some heavy buying late in the month. The domestic pricings reported were also up somewhat.

The strike situation changed. The White Pine strike ended about Oct. 28; it had begun in September and possibly 15,000 to 20,000 tons was lost. The company is negotiating with GSA over the price it will get for its copper on its escalation priced stockpile contract. The base was about 25½c. The escalation on another firm's contract is about 3.05c; some analysts feel the escalation on the White Pine contract is less. The Caspe Copper Mines strike in Quebec was settled late in Oct.; it began March 10.

At least one large U. S. copper firm is reported arranging contracts for sale of copper in Europe covering 5 years; they may contain optional pricing on the LME and *E&MJ* foreign prices. Possibly also buyers will be permitted to stop on 90 days notice.

Some copper refined in Baltimore and shipped to the U. K. is reported as having been resold and returned to the U. S. Most factors believe it had been sold by a U. S. producer in the U. K.

Kennecott announced it will build a 7,000-tpm electrolytic refinery near Baltimore, Md.

San Manuel (output 5,500 tpm) is getting 24c plus 3.05c escalation on its stockpile contract with the U. S. Government. Magma Copper Co. reported all its Arizona output is being sold at the *E&MJ* domestic copper average price.

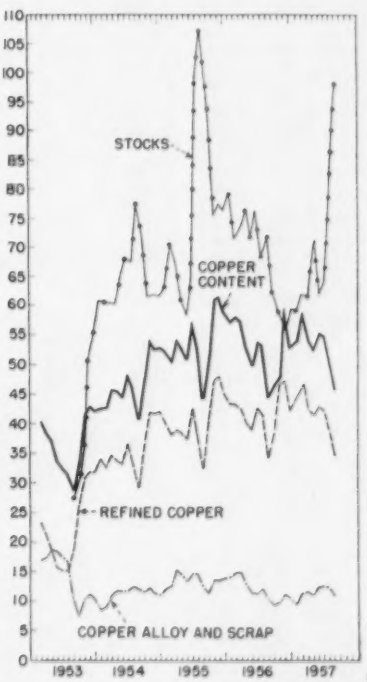
Aluminum supply will be in excess of demand for several years, Nathanael Davies, president of Aluminium, Ltd. of Canada said. He gave this as the reason for stoppage of work on the 120,000 ton expansion project at Kitimat. But 40,000 tons can be activated in six months and another 40,000 in three months. It will continue work on development of more power facilities.

Russian aluminum is offered in large amounts at £184 landed in the U. K. Heavy amounts were sold at about £185 in August. Norwegian aluminum is about meeting this price and some factors say U. S. primary aluminum has also had to meet it; this is denied by U. S. producers one of whom says it is meeting only the Alcan price (£197 delivered, about £193 c.i.f.). Some U. S. primary aluminum is reported resold by fabricators at less than 25c in the U. S.

Lead and zinc markets are little changed. A major custom smelter cut lead to 13½c New York. But the market situation does not look bad for lead—the statistical position is better than for copper or zinc. Many factors expect the increased tariff to be put in effect in January or February and foreign prices to drop by then. But if the U. S. stops lead and zinc stockpiling the increased amounts of U. S. metal could offset the tariff increase effect on U. S. prices.

Tin surplus for the year will be about 12,500 tons the Tin Council said; it had formerly estimated the excess at much less than this. It now has about 10,000 tons in its holdings. The market has been weak and the Tin Council buying has kept the price at about 730 £.

U. K. Copper Fabricating



Data in thousands of long tons refer to copper content of fabricated products. Two months moving averages "except stocks". From British Bureau of Nonferrous Metal Statistics. Data through August 1957.

Average Prices Oct. (E&MJ Quotations)

Copper:	
Electrolytic, domestic refinery	26.335
Electrolytic, export refinery	22.931
Lead:	
Common, New York	13.692
Common, St. Louis	13.492
Silver and sterling exchange:	
Silver, New York, per oz.	90.625
Silver, London, pence per oz.	78.739
Sterling Exchange	279.982
Zinc:	
Prime Western, East St. Louis	10.000
Prime, Western, delivered (g)	10.500
Tin:	
New York Straits	91.875
Gold per oz. U. S. price	$35.000
Quicksilver, per flask	$231.615
Antimony, (E&MJ) (d)	36.590
Antimony, bulk, Laredo	33.000
Antimony, in cases, Laredo	33.500
Platinum, refined, per oz.	$84.000
Cadmium (a)	170.000
Cadmium (b)	170.000
Cadmium (c)	170.000
Aluminum, 99% plus ingot	28.100
Magnesium, ingot	35.250
Nickel (f)	74.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.

(a) Cadmium average based on the producers' quotations.

(b) Cadmium average based on the average of the producers' and platers' quotations.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lots, packed in case f.o.b. New York.

(f) Contract price, f.o.b. Port Colborne, U.S. duty included. Other regular sellers 78¼c to $1.25.

(g) Delivered where freight exceeds 0.5c.

"Free" Gold Market

Trade volume declined 17% in October. Price fluctuations were minor. No Soviet gold sales were reported, but substantial sales were expected in Europe before the end of the year. Continental transactions were led by Paris where average daily turnovers were $1.3-million. Asiatic markets showed increased demand. Mexico again listed the world's lowest gold price, $34.50 per ounce. Pick's World Currency Report quotes on "free gold" per fine oz as follows:

	COINS		BARS (12.5 kg)	
	Sept.	Oct.	Sept.	Oct.
NEW YORK, transit	.....	.....	$35.08½	$35.08½
MANILA	$44.25	$44.25	36.45	36.50
HONG KONG	45.75	46.25	38.45	38.45
BOMBAY	57.25	58.00	56.25	57.25
TANGIER	42.75	42.50	35.20	34.98
BEIRUT	43.50	43.20	35.10	35.15
PARIS	44.25	44.00	36.35	36.45
BUENOS AIRES	39.00	39.50	36.10	36.45

Note: Prices are quoted at the free or black market value of the U. S. dollar in the local markets.

Custom Smelter Copper Price

Based on flat price and E&MJ-average price sales in U. S. for month of October reported by American Smelting & Refining Co.: (electrolytic copper in standard shapes, adjusted to nearest ⅛c, ¼c, deducted for selling commission)

Delivered Consumers' plants	25.500c l b
F.o.b. refinery	25.100c l b

Major Metals

U. S. DAILY AND AVERAGE PRICES

Oct. 1957	Electrolytic Copper (a) Domestic	Electrolytic Copper (b) Export	Lead New York	Lead St. Louis	Zinc (f) Delivered	Zinc East St. Louis	Aluminum Primary Pig 99%	Straits Tin New York
1	26.525	23.850	14.000	13.800	10.500	10.000	26.000	93.125
2	26.350	24.225	14.000	13.800	10.500	10.000	26.000	92.875
3	26.325	23.950	14.000	13.800	10.500	10.000	26.000	92.625
4	26.475	23.700	14.000	13.800	10.500	10.000	26.000	92.625
5	No Market	23.700	14.000	13.800	10.500	10.000	26.000	92.625
7	26.425	23.875	14.000	13.800	10.500	10.000	26.000	92.500
8	26.350	23.925	14.000	13.800	10.500	10.000	26.000	92.500
9	26.325	23.850	14.000	13.800	10.500	10.000	26.000	92.375
10	26.125	23.250	14.000	13.800	10.500	10.000	26.000	92.375
11	26.550	22.950	14.000	13.800	10.500	10.000	26.000	92.000
12	No Market	22.950			Holiday			
14	26.450	22.450	13.500	13.300	10.500	10.000	26.000	92.000
15	26.250	22.300	13.500	13.300	10.500	10.000	26.000	92.000
16	26.475	22.450	13.500	13.300	10.500	10.000	26.000	92.000
17	26.250	22.425	13.500	13.300	10.500	10.000	26.000	92.000
18	26.475	22.700	13.500	13.300	10.500	10.000	26.000	91.750
19	No Market	22.700	13.500	13.300	10.500	10.000	26.000	91.750
21	26.150	22.725	13.500	13.300	10.500	10.000	26.000	91.500
22	26.400	22.375	13.500	13.300	10.500	10.000	26.000	91.125
23	26.575	22.175	13.500	13.300	10.500	10.000	26.000	91.250
24	26.275	21.975	13.500	13.300	10.500	10.000	26.000	91.250
25	26.275	22.175	13.500	13.300	10.500	10.000	26.000	91.000
26	No Market	22.175	13.500	13.300	10.500	10.000	26.000	91.000
28	26.300	22.475	13.500	13.300	10.500	10.000	26.000	91.375
29	26.100	22.425	13.500	13.300	10.500	10.000	26.000	91.375
30	26.200	22.700	13.500	13.300	10.500	10.000	26.000	91.000
31	26.075	22.700	13.500	13.300	10.500	10.000	26.000	90.750
AVERAGES FOR MONTH								
Oct.	26.335	22.931	13.692	13.492	10.500	10.000	26.000	91.875
AVERAGES FOR WEEK								
Oct.								
2	26.510	23.858	14.000	13.800	10.500	10.000	26.000	93.458
9	26.380	23.833	14.000	13.800	10.500	10.000	26.000	92.542
16	26.370	22.725	13.700	13.500	10.500	10.000	26.000	92.075
23	26.370	22.517	13.500	13.300	10.500	10.000	26.000	91.917
30	26.230	22.321	13.500	13.300	10.500	10.000	26.000	91.167
CALENDAR WEEK AVERAGES								
Oct.								
5	26.440	23.900	14.000	13.800	10.500	10.000	26.000	92.875
12	26.355	23.467	14.000	13.800	10.500	10.000	26.000	92.350
19	26.380	22.504	13.500	13.300	10.500	10.000	26.000	91.917
26	26.335	22.267	13.500	13.300	10.500	10.000	26.000	91.188

Silver. Gold and Sterling

DAILY AND AVERAGE PRICES

Oct. 1957	Silver (c) New York	Silver London	Sterling Exchange	Gold London	Gold (d) United States
1	90.625	78.750d.	279.5000	250s. 1¾d.	$35.00
2	90.625	78.750d.	279.4375	250s. 3d.	35.00
3	90.625	78.750d.	279.6875	250s. 3d.	35.00
4	90.625	78.750d.	279.8312	250s. 0d.	35.00
5	(e)	(e)	(e)	(e)	35.00
7	90.625	78.750d.	280.0000	249s. 11d.	35.00
8	90.625	78.750d.	280.0937	249s. 8¾d.	35.00
9	90.625	78.500d.	280.2437	249s. 8½d.	35.00
10	90.625	78.750d.	280.0000	249s. 9d.	35.00
11	90.625	78.750d.	279.9062	249s. 11½d.	35.00
12	(e)	(e)	(e)	(e)	Holiday
14	90.625	78.750d.	280.2312	249s. 10½d.	35.00
15	90.625	78.750d.	280.3125	249s. 9d.	35.00
16	90.625	78.750d.	280.4062	249s. 7¼d.	35.00
17	90.625	78.750d.	280.1093	249s. 8¾d.	35.00
18	90.625	78.750d.	279.8437	250s. ¾d.	35.00
19	(e)	(e)	(e)	(e)	35.00
21	90.625	78.750d.	280.2812	249s. 8d.	35.00
22	90.625	78.750d.	280.1875	249s. 6¾d.	35.00
23	90.625	78.750d.	280.1250	249s. 7¾d.	35.00
24	90.625	78.750d.	279.8937	249s. 8¾d.	35.00
25	90.625	78.750d.	279.9062	249s. 10½d.	35.00
26	(e)	(e)	(e)	(e)	35.00
28	90.625	78.750d.	280.1250	249s. 8½d.	35.00
29	90.625	78.750d.	280.0000	249s. 7½d.	35.00
30	90.625	78.750d.	279.8562	249s. 10½d.	35.00
31	90.625	78.750d.	279.6187	249s. 11½d.	35.00
AVERAGES FOR MONTH					
Oct.	90.625	78.739d.	279.982	—	35.00
AVERAGES FOR WEEK					
Oct.					
2	90.625	—	279.301	—	35.00
9	90.625	—	279.971	—	35.00
16	90.625	—	280.171	—	35.00
23	90.625	—	280.109	—	35.00
30	90.625	—	280.079	—	35.00

Calendar Week Averages: New York Silver: Oct. 5th, 90.625; 12th, 90.625; 19th, 90.625; 26th, 90.625.

(e) No Market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.400c per pound, the average differential for delivery charges.

(b) Our export quotations for copper reflect prices obtaining in the open market and are based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.125c for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingots; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West effective Jan. 1, 1951, commanded a premium of 1.35c per pound over the current market for Prime Western; Special High Grade 1.75c effective Dec. 1, 1955.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 pounds.

(e) The daily silver quotation reported by Handy & Harman, in cents and fractions of a cent per troy ounce, is the price paid by Handy & Harman in settlement for silver contained in unrefined silver-bearing materials submitted to them for refining. It is determined on the basis of offers of bar silver .999 fine as made to Handy & Harman for nearby delivery at New York by regular suppliers in quantities sufficient to meet daily requirements, and it is usually one quarter cent below the price at which such offers are made.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

London Metal Exchange Quotations

Oct.	COPPER Cash Bid	COPPER Cash Asked	COPPER 3 Mo. Bid	COPPER 3 Mo. Asked	LEAD Current Month Bid	LEAD Current Month Asked	LEAD 3 Mo. Bid	LEAD 3 Mo. Asked	ZINC Current Month Bid	ZINC Current Month Asked	ZINC 3 Mo. Bid	ZINC 3 Mo. Asked	TIN Cash Bid	TIN Cash Asked	TIN 3 Mo. Bid	TIN 3 Mo. Asked
1	192½	193	195¾	196¼	89	89¼	89¼	90	71	71¼	71¾	72	739	739½	737	737½
2	194	194½	197	197¼	88¾	89	89¾	90	70¾	71	71¼	71½	736½	737	735½	736
3	190	190½	193½	194	88	88¼	89	89¼	70½	70¾	71	71¼	735	735½	734½	735
4	192½	193	196	196¼	88¼	88½	89¼	89½	70½	70¾	71	71¼	734½	735	735	735½
7	190½	191	194¼	194½	88	88¼	88½	88¾	69½	69¾	70	70¼	731	731½	732½	733½
8	190	190½	193¾	194	87½	87¾	88¼	88½	69¾	70	69¾	70	730½	731½	733½	734
9	189¼	189¾	192½	193	87½	87¾	88	88¼	70	70¼	70	70¼	730	730½	733	733½
10	188	188¼	192	192¼	87¼	87½	87¾	88	69¾	70	69¾	70	730	730½	732	732½
11	184½	185	187½	188	84½	84¾	85¼	85½	68¾	68½	68	68¼	730	730½	728½	729
14	182½	183	186½	187	84½	84¾	85	85¼	68	68¼	68¼	68½	730	730½	726½	727
15	181½	182	185½	186	84½	84¾	84¾	85	67	67½	67	67¼	730	730½	725½	726
16	183¼	183¾	187½	188	85	85½	85½	85¾	68½	68¾	68½	68¾	731	731½	727½	728
17	184	184½	188	188½	85½	85¾	85½	85¾	68	68¼	68¼	68½	731	731½	728	729
18	182	182¼	186	186¼	84¾	85	85¼	85½	68	68½	68¾	68½	730	730½	726	726½
21	181¾	182	185½	186	84½	85	85	85¼	68	68¼	68	68¼	730	730½	725½	726
22	180½	181	184	184½	83¾	83½	84	84¼	67¾	68	67½	67¾	730	730½	723½	724
23	179	179½	182¾	183	83	83¼	83⅞	84	67	67¼	66¾	67½	730½	731	724½	725
24	182¼	182½	185½	186	83½	84	84½	84½	68	68¼	67¼	68	730½	731	725	726
25	183	184	186¾	187	84	84½	84½	85	68¼	68½	68	68¼	730½	731	724½	725
28	185	185½	188½	189	84½	84¾	85	85¼	68¾	69	68¼	68¾	731	731½	725½	726
29	188	188½	191½	191¾	85¼	85½	85¾	86	70¼	70½	69¾	70	730	730½	725	726
30	189	190	192	192½	85½	85¾	86¼	86½	70½	71	70	70¼	730	730½	724	724½
31	190½	190¾	194	194¼	86	86¼	86½	86¾	70¼	70½	70	70¼	730	730½	722½	723½
Av'g's	£186.484		£190.038		£85.905		£86.505		£69.179		£69.215		£731.609		£728.783	

Prices are for the official a.m. session in pounds sterling per ton of 2240 lb. Copper basis wire bars, lead 99.97%, zinc 98¾ and tin min. 99.75%.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated, tons of 2,000 lb. unless otherwise noted. St—short ton; lt—long ton.

MISCELLANEOUS METALS

October 31, 1957

Aluminum ingot, 99⅟plus % lb.			28.1¢
Antimony, spot, lb. less than carload, in cases			36.59¢
In bulk, carload lots, f.o.b. Laredo			33.00¢
Bismuth, ton lots, lb.			$2.25
Cadmium, commercial sticks, delivered, lb.			$1.70
Calcium, lb. ton lots, 98%, cast			$2.05
Chromium, 97% grade, lb. contract del.			$1.29
Cobalt, 97 to 99%, per lb. eff. Feb. 1, 1957			$2.00
Germanium, per gram, 10,000 gram lots	(c)38¢ @	(d)45½¢	
Indium, troy oz.			$2.25
Lithium, lb. 98%	$11.00 @	$14.00	
Nickel, cathodes, lb. (a)			74¢
Other sales, reg. sellers			74¢
Sales by dealers, etc.	70¢ @	77¢	
Magnesium, 99.8% carloads, lb. producer's plants Velasco, Texas, eff. Apr. 16			35½¢
Palladium, troy oz.	$21.00 @	$22.50	
Platinum (wholesale lots), troy oz.	$81 @	$87	
Quicksilver, flask of 76 lb., 25 flasks or more	$230 @	$233	
Selenium, 99 plus %, lb. (May 28, 1957)			$10.50
Silicon, minimum 97%, carloads, lb.			22¢
Semi-Conductor grade, lb.			$350
Tellurium, lb.			$1.65
Thallium, 100 lb. or more, lb.			$12.50
Titanium, 99.3 plus, grade A-1, max. 3% iron, lb.		(b)	$2.25

(a) Eff. Dec. 6, 1956; incl. U. S. duty; (b) Effective June 3, 1957.
(c) Delivered; (d) f.o.b. plant

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per short ton unit	$36.00 @	$37.00	
Chrome Ore per long ton, f.o.b. cars Atl. ports, dry:			
44% Cr_2O_3 no ratio	$30 @	$30.50	
48% Cr_2O_3 3 to 1 ratio	$51 @	$57	
Iron Ore, Lake Superior, Lower Lake ports, long ton:			
Old Range bessemer		$11.85(e)	
Mesabi bessemer		$11.60(e)	
Mesabi, non-bessemer		$11.45(e)	
Lead (Galena), 80%, Joplin, Mo., ton		$163.32	
Manganese Ore—Per long ton unit of Mn basis 48% manganese, nearby positions, subject to premiums and penalties, c.i.f. U. S. ports, import duty extra, export duty included, $1.40 @ $1.43; both duties excluded, $1.265 @ $1.295. Long-term contract nominal.			
Molybdenum Ore, 90%, per lb. of Mo f.o.b. mines	$1.18 @	$1.23	
Columbium-Tantalum, per lb., combined oxides 10 to 1 ratio	$1.15 @	$1.20	
Tungsten Ore, per stu of WO_3:			
Foreign 60%, c.i.f. U. S. ports, duty extra	$12 @	$14	
U. S. mined concentrate, per stu, f.o.b. mill (GSA price) (Suspended)		$55	
Vanadium Ore, per lb. of contained VO_3 f.o.b. mines		31¢	
Zinc Ore, Prime, 60% concentrate, Joplin, Mo., per ton		$56	

(a) Nominal.
(e) Eff. 1957 shipping season.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered			5½¢
Cobalt Oxide, 72½% to 73½%, per lb. eff. Dec. 1, '56	$1.52 @	$1.55	
Copper Sulphate, 100 lb. eff. Sept. 3, '57		$11.55	
Germanium Oxide, gram		27½¢	
Molybdic trioxide, technical, per lb of Mo	$1.38 @	$1.41	
imported, incl. 37¢ duty	$1.75 @	$2.05	

ALLOYS

Ferrochrome 65 to 70%, per lb. of Cr. (4-9% C)			28¾¢
Ferromanganese, 74 to 76%, per lb., ships. pt.			12½¢
Ferromolybdenum, 58 to 64% Mo, lb. of Mo contained	$1.68 @	$1.74	
Ferrosilicon, 50% per lb. of Si f.o.b. shipping point (3-19-57)			14.20
Ferrotungsten, 72 to 82%, lb. of W contained			$2.15
Ferrovanadium, per lb. of V delivered	$3.20 @	$3.40	
Silicomanganese, max. 1½% carbon, lb., contracts			12.8¢
Spiegeleisen, per long ton, 19 @ 21% grade eff. Jan. 7			$102.50

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (Canadian funds) ton:			
Crude No. 1	$1,470 @	$1,810	
Crude No. 2	$788 @	$1,155	
Spinning fibers	$353 @	$593	
Shingle fibers	$190 @	$220	
Paper stock	$120 @	$142	
Waste	$82 @	$86	
Shorts	$27 @	$75	
Asbestos, f.o.b., Vancouver, B. C. (Canadian funds):			
Crude No. 1			$1,522
AAA			$787
Asbestos, Vermont, f.o.b. Hyde Park:			
Spinning fibers	$353 @	$383	
Shingle stock	$172 @	$190	
Paper stock	$114 @	$145	
Waste, stucco or plaster			$82
Refuse or Shorts	$39 @	$72	
Barytes f.o.b. cars:			
Georgia, crude, per ton			$18
Missouri, 94% $BaSO_4$, per short ton	$16 @	$18	
Crude oil well grade, min. 4.3% sp. gravity, at (a)			$18
Imported, c.i.f. Gulf Ports, at	$16 @	$18	
Bauxite, long ton, f.o.b. point of shipment:			
Domestic, crude, 50 to 52% (not dried)	(c)$ 5.00 @	$5.50	
Domestic, chemical, 55 to 58%	(c)$ 8.00 @	$8.50	
Domestic, abrasive, 80 to 84%	(c)$18.00 @	$18.50	
Imported metallurgical, per lt, f.o.b. Br. Guiana, dep. on grade			$7.14
Feldspar, bulk ton:			
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @	$22.50	
Glass feldspar, white, 20 mesh	$11.75 @	$12.50	
Fluorspar, f.o.b. mines, bulk, 72½% effective, ton	$33 @	$41	
60% effective CaF_2	$30 @	$36.50	
Acid 97% concentrate, bulk, ton (eff. 12-1-56)			$50.00
Some sellers quote			$55
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @	$14.00	
Magnesite, per ton dead-burned, bulk, f.o.b. Washington			$46
Mica—Domestic, f.o.b. mines. Punch 7¢ to 12¢ per lb. according to size and quality. Sheet clear, 1½ x 2-inch, 70¢ to $1.10; 2 x 2-inch, $1.10 to $1.60; 2 x 3-inch, $1.60 @ $2.10; 3 x 3-inch, $1.80 @ $2.30; 3 x 4-inch, $2.00 @ $2.60; 3 x 5-inch, $2.60 @ $3.00; 4 x 6-inch, $2.75 @ $4.00; 6 x 8-inch, $4.00 @ $8.00. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap, $25 and up.			
Ocher, Georgia, ton, in sacks	$26.50 @	$32.00	
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports		Not quoted	
Sulphur, per lt, f.o.b. U. S. mines: bright			$23.50
dark	$22.50 @	$23	
Mexican, for use in Mexico, per metric ton, f.o.b. mines, 280 to 395 pesos, depending on use	$22.40 @	$31.60	
For export f.o.b. vessel, dep. on grade	$22 @	$24	
Talc, f.o.b. works, ton:			
New York, purified	$18.00 @	$20.00	
Vermont, extra white			$12.50
Tripoli, Missouri, ton:			
40-mesh, cream colored			$50.00

(a) Some restricted sales at $11.50. (b) Corrected. (c) Nominal.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces			$66.00
Steel, f.o.b. Pittsburgh, billets, net ton			$77.50
Structural shapes, Pa., Ala., etc., 100 lb.	$5.10 @	$5.275	

R. D. PARKER, Inco's general manager, explains scope of new project with maps showing (left to right) Thompson townsite; Thompson mine plant, mill, smelter and refinery; Thompson and Moak mines; and surface plant at Moak Lake mine.

Inco Reveals Thompson-Moak Targets

BY LATE 1960 International Nickel Co.'s new $175-million, Thompson-Moak Lake, two-mine project in northern Manitoba is expected to build up to an annual production capacity of 75-million lb of nickel. This was revealed to some one hundred members of provincial and national government, and the Canadian and U. S. press on Oct. 20 at an "Operations Last Spike" ceremony marking completion of the 30-mile Canadian National rail spur which will serve the operation. Production from this new project will increase Inco's total annual nickel-producing capacity to 385-million lb by 1961.

Inco undertook extensive geologic reconnaissance of the area in 1946 because of favorable previous showings at Herb Lake and elsewhere. Aerial support in the form of airborne magnetometers and electro-magnetic instruments hastened the delineation of favorable zones which were later probed by more than 1-million ft of diamond drilling costing some $6.75-million through August 1957. Up until Jan. 1, 1957, it cost Inco about $10-million to explore and develop the area.

Inco's holdings at Thompson-Moak Lake comprise some 6,000 claims in a 10x80-mile area of about 300,000 acres. These holdings are leased from the Manitoba government on a 21-year agreement, with provisions for two additional 21-year extensions. Two mines are under development: The Thompson mine at the new railhead served by a development shaft and a production shaft some 2900 ft away; and the Moak Lake mine which will be connected with the Thompson site by a company-owned 22-mile railroad. Production from the two mines will total about 9,000 tons daily—approximately one-fourth to come from the Thompson, and the balance from the Moak Lake mine.

When questioned why the mill and smelter had been located at Thompson instead of Moak Lake, officials said there appear to be other nickel showings in the concession area that might warrant future development, and, in such case, the Thompson site would prove to be more centrally located.

Although grade of ore has not been established, it is expected that combined output of the Thompson-Moak mines will result in an average nickel grade slightly higher than that at the company's mines in Sudbury. Copper values are not high enough to be of commercial interest, but cobalt, platinum, palladium, gold and silver content will assist in making the project successful.

A soft peridotite comprises the orebodies. Whether the peridotite is a sill with limbs folded upwards, or whether it consists of steep dikes, has not been determined. Diamond drills have disclosed nickel values as deep as 3,000 ft below the surface in some spots.

Because of the softness of the rock, it is expected that mining methods will include blast-hole drilling, square-setting and caving—with some possibility that the lake may be drained to get at near-surface blocks of ore by open-pitting. Ground is soft enough in some areas to permit use of rotary tungsten-carbide bits. A friction-drive hoist will be installed at the Thompson production shaft.

Expenditures for the four-year construction and development program will total $175-million, of which Inco's share will be $115-million. Cost of construction dwellings at Thompson will be about $20-million. Individual home ownership will be financed by recognized lending institutions. Stress on individual home ownership by Inco means two things: The mine will have a long life, and Manitoba's frontier of industrialization will be pushed substantially northward.

Manitoba Hydro-Electric Board will supply power for the project from a new plant at Grand Rapids, on the Nelson River, some 50 miles away from Thompson. Inco will use nearly all of the initial 168,000 hp supplied by four generators, but room will be provided for six more units. The company is assisting in the power development with a $20-million loan to the Manitoba Hydro-Electric Board.

Other facts, in brief, for the project are as follows: Commencement of milling July 1, 1960; number of men to be employed, 2,000; estimated size of community at Thompson 8,000 persons; refining facilities, to be established in Manitoba.

Officials who participated in the spike-driving ceremony included D. L. Campbell, Premier of Manitoba; Paul Comtois, Federal Minister of Mines; F. L. Jobin, Manitoba Minister of Industry and Commerce; F. Bell, Minister of Mines of Manitoba; C. E. Greenlay, Treasurer of Manitoba; Robert Simpson, Member of Parliament for Churchill District; J. S. Richards, Director of Mines of Manitoba; Marc Boyer, Deputy Minister of Mines of Ottawa and R. D. Parker, general manager of Inco. Premier Campbell drove the ceremonial spike home, while Canada's colorful railroader, Major J. L. Charles, held the spikebar.

Aluminium Ltd. Speeds Borneo Bauxite Plans

EARLY 1958 is the target for mining of bauxite deposits located in western Sarawak on the island of Borneo, in the South Pacific, according to Aluminium Ltd. of Montreal and E. Ott, representing the Ott group, the joint shareholders of Sematan Bauxite Ltd.

Shipments of the ore are expected to begin during 1958 with an anticipated yearly production of about 175,000 tons. Bauxite, which is of good grade, will go principally to Japan.

Deposits in Sematan are believed capable of producing 2.5-million tons, and other deposits are believed to lie in the vicinity.

Mining equipment to be used will be purchased largely in Japan, and the new washing plant should be installed at Sematan in western Sarawak by the end of 1957.

USSR Cites Iron Find

LARGE DEPOSITS of brown hematite have been discovered at Lisakovka, in Kazakhstan, according to Viennese sources. Ore is described as powdery, high-grade, and easily mineable by open pit methods. First unit, a mine plant, town and concentrator, will start construction early next year with a planned annual production of 30-million tons of iron ore.

Mining Calendar

International Mining Days '57 and 1957 Annual Meeting of New Mexico Mining Association, El Paso, Texas. Nov. 7-9

Society of Exploration Geophysicists, 17th annual meeting, Dallas, Tex. Nov. 11-14

Institute of Metals, (London) inaugural meeting of powder metallurgy group. Church House, London, Dec. 4

Governor's Industrial Safety Conference (California). Eighth annual meeting. San Francisco, Feb. 6-7

National Western Mining Conference, Feb. 6-8 Denver, Colo.

AIME, annual meeting. Hotel Statler and Sheraton-McAlpine, New York. Feb. 16-10

Pacific Southwest Conference, AIME, St. Francis Hotel, San Francisco, March 17-29

Lost River for Sale

THE ONLY TIN MINE in North America was to be offered for sale at public auction Oct. 30. Mine is the Lost River, Alaska mine of U. S. Tin Corp., 100 miles northwest of Nome. Government foreclosed on the property in 1954 following company's failure to repay loans made between 1951 and 1954.

(*This Month continues on p 144*)

As We Went to Press . . .

"We have arrived at the point where it is no longer in the interest of the Government to expand production of uranium concentrate," according to Jesse C. Johnson, chief of the raw materials division, AEC, who spoke at the Atomic Industrial Forum in New York, Oct. 28.

AEC intends to keep its purchasing program at the present level, Johnson said, noting that "deliveries under . . . present domestic and foreign commitments appear adequate for military and power requirements . . . for the next few years.

"It would be undesirable from the standpoint of industry, as well as the Government, to expand the uranium production rate beyond currently projected requirements and then be faced with a major curtailment at some later date."

Johnson said commitments for additional uranium production and for additional mill construction "will be considered in the light of discussions which have taken place." Mill contract preference "will be given to providing a limited market for areas having no present milling facilities."

In asking for continued exploration, the division chief noted that the commission does not want to create the impression that the U.S. has "too much" uranium.

Ore will be needed, Johnson said, to build up reserves for expanded demands by nuclear power by 1970 or 1975. A symposium on future markets for uranium at the Cosmopolitan Hotel, Denver, Dec. 16 and 17, will no doubt take particular notice of the Johnson announcement. The meeting is co-sponsored by Uranium Institute of America and U. S. Chamber of Commerce.

In another Government move, AEC has terminated National Lead Co.'s contract for operation of the uranium processing pilot plant at Grand Junction and the research laboratory at Winchester, Mass. effective June 30, 1958. Robert Beverly, manager of the GJ pilot plant said his company hoped to see the facility taken over and operated as a private enterprise.

AS&R has 65-million tons of copper ore at East Pima, Ariz., just north of Silver Bell. Find, on the Papago Indian Reservation, where the firm offered over $1-million for mineral rights, contains ores of about 0.9% Cu . . . Newmont Mining Corp. has joined an exploration and development contract with Atlas Consolidated Mining & Development Corp. to develop Philippine copper deposits and search for new orebodies. Newmont was paid with Atlas stock . . . Kennecott Copper Corp. will build a $20-million electrolytic refinery in Anne Arundel County, Md. Braden ore will be processed in 1959 at the new facility with initial capacity at 7,000 tpm.

Aluminum keeps on going. Queensland State Cabinet has approved an agreement for Consolidated Zinc Corp. to mine bauxite in the Cape York area of northeast Australia. Joining the increased activity are Alcan, who recently requested authority to mine and export, and Reynolds, who has just formed Reynolds Pacific Mines Pty. Ltd. . . . Alcan is going ahead with its 20% participation in the French West African aluminum complex with Pechiney and Ugine. Target date is 1964 if hydroelectric project goes as planned . . . Alcoa has announced an aluminum-lithium alloy which remains strong at 400 deg F and which improves weight of aircraft as well.

Behind the By-Lines...

While there is much of the era 1941-1945 we'd just as soon forget, we confess to a regard for the resounding Churchillian titles which The Military assigns to campaigns. Somehow we felt better when they called the grey Normandy beaches "Overlord", and North Africa became "Torch" and the south of France "Anvil."

Around here, we also tend to re-name the issues that come boiling out to you. The 89th Annual Survey and Outlook Issue, for instance, is called "february."

One look at the cover will give you the clue to this month's cognomen. This is the "people" issue—people concerned with zinc, with tariffs, with ore dressing, with the business outlook for next year.

Back for the third time, and still undefeated in his field, is William P. Shea. Mr. Shea's previous labors in the economic vineyard on copper and lead are now joined by the definitive word on zinc. Next time you're waiting for a traffic light to change you might devote a few minutes to the effect of past tariffs on the long-term price of zinc.

On page 86, another of our "people" takes a different look at zinc and its sister metal, lead. Among the many intriguing statements in Andrew Fletcher's article is the suggestion of a program that would benefit the consumer, the fabricator, the nation and the domestic and foreign producer.

That smiling group on the cover has good reason to look happy. They're taking part in one of the most stimulating conferences held in recent years. *E&MJ* was there, and you'll feel that you were too, after beginning the tour of modern ore dressing which begins on page 79.

Truth, in the literary field at least, is still holding its own. Stranger than fiction, and as exciting as a suspense novel is "Air Spy," by Constance Babington-Smith, a lady who took an important role in the development of air reconnaissance and photo interpretation during World War II.

We're indebted to Hunting Aerial Services Ltd. for our advance copy of this quiet account of daredevil pilots, dedicated interpreters and bold red-tape cutters pursuing military information and stumbling upon the unknown shapes and mechanisms which became the dreaded V-1 and V-2. We recommended it highly.

But we must cavil at one error in the book. The commanding general of the Northern troops outside Richmond in 1862 who authorized use of an observation balloon was not named McLennan! General George Brinton McClellan of the Army of the Potomac made some monumental errors in his time, but, to his everlasting credit, he never used an alias. Fie on you, Harper & Brothers, Publishers.

To Miss Babington-Smith, our congratulations and gratitude for including the motto of the fliers who were told to photograph the well-defended French ports. "The reconnaissance of Brest was of supreme importance. It was 'Brest or bust' as the pilots used to say."

After all these years of editing market stories, we've finally learned what is meant by lead consumers. The *Wall Street Journal* says the Illinois Bell System's experts have found the reason why squirrels nibble thousands of dollars worth of lead sheathing off telephone cables every year.

New theory is that the culprits may be pregnant squirrels who crave the taste of lead "much like human mothers-to-be yearn for strawberries in the a.m."

Our Canadian traveler suggests that U.S. lead miners now give full support to a program for development of a new species of squirrel, "Sciurus Voracious Amourousis." New strain will be the result of crossing Sciurus Vulgaris—the common nut rat—with a mink.

In these parlous times, it is reassuring to see the industry's friends rally 'round. In the past several weeks we've received any number of suggestions calculated to hasten the return of base metals to their normal position in the economy.

The basic research boys learned long ago that many an idea which seemed farfetched could provide the vital key, so we've been passing along any and all ideas to interested offices.

One recent letter, noting the drop in zinc and copper, set us thinking.

Where, Victor Hansen of Bremerton, Wash., asks, have the bells gone? He says, "It used to be traditional to have bells in almost every school and church," and here was the phrase that caught us, ". . . to remind everyone that the spirit of enlightenment is available."

We're with Mr. Hansen. Here's to more bells and a little more of that spirit, too.

We've got another letter, this one from Burton Westman, of Aloha, Ore. Mr. Westman purchased some mineral specimens from the late Dr. F. G. Hearn, of Yreka, Calif. and found the following entry in a specimen book:

> No. 79 Bogus gold dust from New York, 1852. Four kegs of 100 lb each, shipped to California. Presented by Dr. E. Wadsworth.

The listed specimen is not among the collection now in Mr. Westman's possession and he's been wondering about it. While we're not surprised that bogus gold dust was being sold in New York just three years after the Gold Rush, we are in awe of a man who'd send it to California.

Dexter M. Keezer, chief of McGraw-Hill's economics department, besides being the author of Business Outlook—1958, which you'll find on page 98, is also a collector of bits-of-information-you-wouldn't-have-if-you-didn't-have-these-bits of-information. His most recent report to editors included the following:

"Note on the fitness of things: The county in all the U.S.A. that is tied for first place in the rate, per thousand, at which women produce daughters is Loving County, Texas."

WILLIAM P. SHEA

One Hundred Years of Zinc

THE WORLD ZINC POSITION during the eleven years from the close of World War II to the end of 1956 is summarized on Table I. In brief, during the eleven years, total world production (including USSR and its satellites) exceeded total world industrial use by 1,006,000 tons. Government and smelter stocks in the United States increased by 846,000 tons and, presumably, stocks outside the U.S. increased by 160,000 tons.

Production Overtakes Demand

It may be observed that in these eleven years U. S. mine production resumed the downward trend which had been in evidence before World War II. Outside the U. S., mine production in all countries, including Russia and its satellites, by 1949 had regained its pre-war volume. From there on, mine production outside the U. S. increased rapidly, reaching the all-time high figure of 2,342,000 tons in 1956. At the same time, world consumption was increasing at a much more moderate rate, and the apparent balance between supply and demand was maintained only by additions to stocks of zinc in the hands of smelters and, especially in the U. S. Government stockpile.

In the U. S. these increases in stocks continued during the first half of 1957 at an accelerated rate, so that, as of June 30, 1957, U. S. smelter stocks stood at 133,000 tons and Government stockpile at an estimated 1,227,000 tons.

With the purpose—after study of long-term trends—of seeking reassurance for the future in face of this eleven-year world-wide oversupply, we set about collecting data on zinc in the U. S. for as far back as we could obtain such data. With some digging, we found that we could obtain figures for the past 100 years, all the way back to 1857, when there was no U. S. production of slab zinc. This seemed a good point at which to start this long-term study of the zinc industry.

Forward to 1975

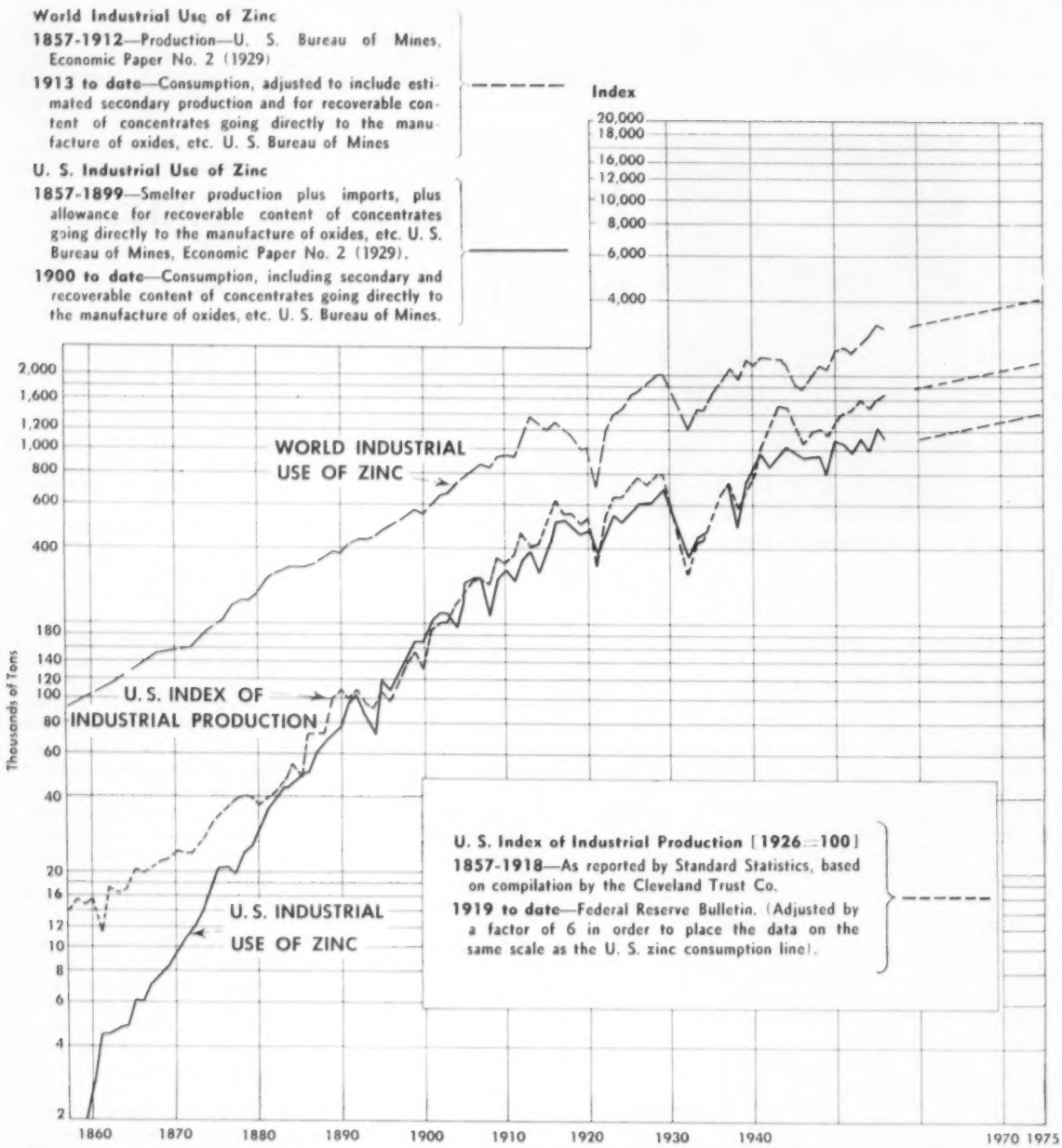
We feel that we have secured the reassurance we sought. It may be demonstrated statistically that the trend of consumption of zinc in the U. S., and, indeed, throughout the world, in all probability will continue upward at about the same rate as has been in evidence over the long-term past. At least there is no apparent present justification for anticipating otherwise. It is likely that consumption of zinc in the U. S. by the year 1975 will be on the order of 1.4-million short tons. It is also likely that the U. S. will pay for this tonnage of zinc a sum of money on the order of $400-million annually, or somewhat over 14.00c a pound. This may sound incautious in the face of the present price of 10.00c a pound and some evidence of a developing fatigue in the current business boom. During the past 100 years, however, the zinc industry has been faced with similar situations several times, and yet throughout has clung to a clearly defined long-term upward trend both in volume and in total annual amount paid by consumers for such volume. For example, in July of 1949, the price of zinc East St. Louis stood at 9.00c a pound, and the Federal Reserve Index of Industrial-Production had declined from 101 to 88 during the preceding seven months. In February 1954, the price of zinc East St. Louis stood at 9.25c a pound and the Federal Reserve Index was in the middle of a fifteen-month decline, from 138 to 116. In each case, both the volume of zinc consumed and the price rose simultaneously with the subsequent recoveries in the production-price index.

Back to 1857

Chart I shows the world industrial use of zinc from 1857 to date, and U.S. industrial use of zinc compared with the U.S. index of industrial production for the same period. With regard to world industrial use of zinc, it is assumed for the years 1857-1912 that production is synonymous with consumption. That is, of course, not true for any particular year, but

Mr. Shea is statistician for C. Tennant, Sons & Co. of New York.

CHART I. World Industrial Use of Zinc and U.S. Industrial Use of Zinc Related to the U.S. Index of Industrial Production. [1926=100]



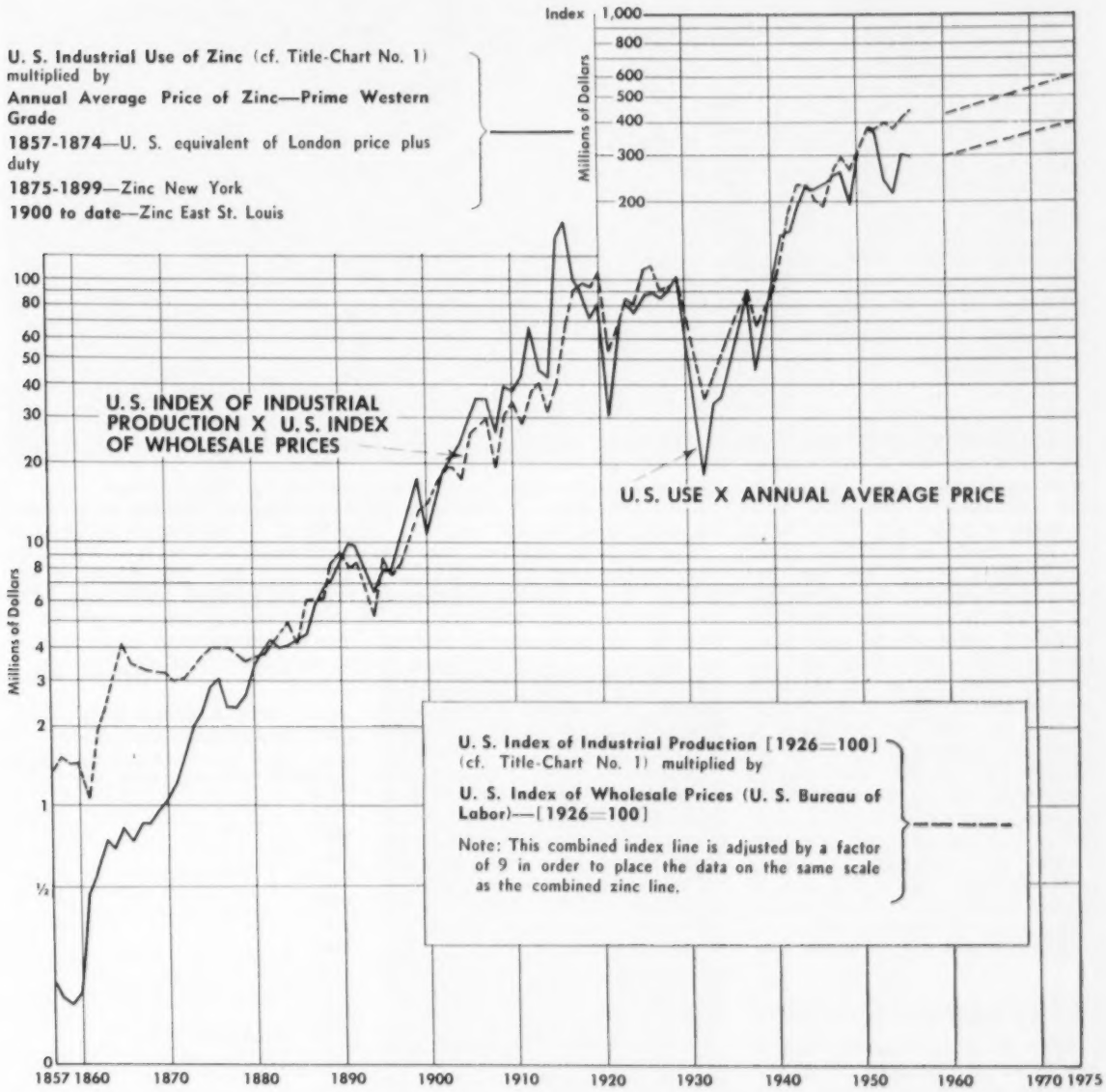
NOTE: FOR CONVENIENCE, index scales on Charts 1 and 2 have been reduced to same scales used for dollars and tonnage.

over a period of 55 years any temporary divergencies would have been ironed out. In any event, the only available data is on production and, for lack of better, we have used it to denote consumption. The U. S. Geological Survey in *Mineral Resources of the United States*, Part I, 1911, p 357, published a chart of production and consumption of spelter in the United States for the period 1860-1911, which shows that the two lines over the period are almost identical. Thus, in the same way, with regard to the U. S., we assume production for the years 1857-1899 was identical with consumption.

In 1857, so far as we have been able to determine, U. S. total mine production of zinc was derived from mines in New Jersey and was used entirely in the production of zinc oxide. All slab zinc used in the U. S., chiefly for brass in those days, was imported. The demands upon U. S. industry imposed by the Civil War, the subsequent railroad building era, and the opening up of the West brought about rapid increases in the requirements for the "new metal."

It may be said that in the decade 1880-1890, zinc in the U. S. came of age, that is, its annual requirement had become so large and it entered into such a variety of end use products that it was necessary to

Chart 2. U. S. Industrial Use of Zinc Multiplied by Annual Average Price of Zinc Related to the U. S. Index of Industrial Production Multiplied by the U. S. Index of Wholesale Prices. [1926=100]


U. S. Industrial Use of Zinc (cf. Title-Chart No. 1) multiplied by
Annual Average Price of Zinc—Prime Western Grade
1857-1874—U. S. equivalent of London price plus duty
1875-1899—Zinc New York
1900 to date—Zinc East St. Louis
Index
Millions of Dollars
1,000
800
600
500
400
300
200
100
80
60
50
40
30
20
10
8
6
4
3
2
1
½
0
U. S. INDEX OF INDUSTRIAL PRODUCTION X U. S. INDEX OF WHOLESALE PRICES
U. S. USE X ANNUAL AVERAGE PRICE
U. S. Index of Industrial Production [1926=100] (cf. Title-Chart No. 1) multiplied by
U. S. Index of Wholesale Prices (U. S. Bureau of Labor)—[1926=100]
Note: This combined index line is adjusted by a factor of 9 in order to place the data on the same scale as the combined zinc line.
1857 1860 1870 1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1975

class zinc as one of the basic industrial metals. Since then (see Chart I), consumption of zinc in the U. S. has fluctuated very closely with the Index of Industrial Production. Their trend lines are almost identical and even the temporary oscillations in each line match very closely.

It may be observed on the chart that since 1941 the Index of Industrial Production has remained consistently above the line of U. S. Industrial Use of Zinc. It should be pointed out that we have simply used a factor of 6 to bring the Index line as close as possible to the Zinc line, and the seeming disparity since 1941 may be simply an arithmetical accident. The important thing is the similarity of the two trends, and it is for this reason that we feel justified in assuming that during the next 18 years the two lines will continue to display a high degree of correlation. It will be noted that we have projected the two trends up to 1975, indicating 230 for the Index of Industrial Production and 1.4-million tons for the U. S. Use of Zinc. In similar manner, it is indicated that total world use of zinc in the year 1975 will be on the order of 4-million tons. World consumption in 1956, including secondary, was 3,080,000 tons and in the U. S. 1,088,000 tons. Thus, for both the world and the U. S., an increase in industrial use of 30% during the next 18 years is indicated. World mine production of zinc (recoverable) plus estimated secondary production amounted to 3,211,000 tons in 1956, so that production will need to be increased by only 25% in order to meet prospective requirements in 1975.

World Production and Use of Zinc—1946-1956

(Thousands of Short Tons)

	U. S.				World ex-U. S.				World				Stocks in U. S.(Est.)	
	Mine product.	Secondary	Total product.	Indus. use	Mine product.	Secondary	Total product.	Indus. use	Mine product.	Secondary	Total product.	Indus. use	Smelter	Gov't
														256*[1]
1946	574	136	710	935	1053	118	1171	830	1627	254	1881	1765		176*
1947	638	163	801	932	1123	164	1287	997	1761	327	2088	1929		68*
1948	630	164	794	951	1237	154	1391	1232	1867	318	2185	2183	21	265*
1949	593	133	726	800	1333	174	1507	1297	1926	307	2233	2097	94	357
1950	623	163	786	1101	1511	185	1696	1407	2134	348	2482	2508	9	485
1951	681	136	817	1068	1607	158	1765	1489	2288	294	2582	2557	22	525
1952	666	124	790	962	1848	143	1991	1455	2514	267	2781	2417	85	545
1953	547	122	669	1104	2015	142	2157	1510	2562	264	2826	2614	180	587
1954	473	133	606	983	2061	154	2215	1835	2534	287	2821	2818	123	697
1955	515	153	668	1228	2248	164	2412	1968	2763	317	3080	2196	39	783
1956	538	157	695	1088	2342	174	2516	1992	2880	331	3211	3080	69	1033[2]
Total	6478	1584	8062	11,152	18,378	1730	20,108	16,012	24,856	3314	28,170	27,164		

*Primary and secondary stocks at metallurgical works including stocks of OMR, but not Government permanent stockpile.
**Includes metal stocks transferred from other Government agencies to the permanent stockpile during 1948.
[1]Dec. 31, 1945, [2]June 30, 1957.

Where will the United States obtain 1.4-million tons of zinc annually in 1975? If mine production in the U.S. continues a downward trend in evidence since 1926, U. S. mines by 1975 should be producing in the neighborhood of 500,000 tons per year. Secondary production in the U. S. will, from present indications, amount to about 200,000 tons. Thus, total domestic production will be 700,000 tons, leaving an additional 700,000 tons to be obtained through imports. Curiously, in 1956, the U. S. (mine and secondary) production was 695,000 tons of zinc and imports (recoverable zinc in concentrates and slab zinc) were 692,000 tons. In 1956, however, of the total zinc available, 250,000 tons were added to Government stockpile and 30,000 tons to smelter stocks. In 1975 we are assuming that all available zinc, 1.4-million tons, will go to industrial uses.

"A High Degree of Correlation"

Chart II shows a combination of the Index of Industrial Production and the Index of Wholesale Prices (U. S. Bureau of Labor). Both are taken at 1926 equal to 100. They are combined to obtain an *index* of the dollar value of commodities flowing into industrial use. To this combined *index* there is compared the annual volume of zinc flowing into industrial use within the U. S., multiplied by the annual average price of zinc. The two lines show a very high degree of correlation.

Since zinc is an industrial metal entering into a great variety of uses, it is to be expected that the use line of zinc would parallel rather closely the line of industrial production. It is noteworthy that the U. S. annual zinc bill, the amount that industry pays for the zinc it uses, has so closely paralleled the index of what industry has paid for all its raw materials.

The trend of the two lines has been sharply upward since the beginning of World War II, a period of 17 years. We prefer, however, to stay with the long-term trend in evidence for 100 years. As we have seen on Chart I, the trend of industrial production will probably continue moderately upward. If we assume that the general average of commodity prices will tend to stabilize at about present levels, the combination of the two, projected into the future, is practically identical with the projection of the 100 year trend as shown on Chart II and this indicates that the combined index on the chart will reach 600 by 1975. If we may further assume that the volume-price of zinc will continue its long-term correlation with the industrial Production-Wholesale Price index, we may expect that by 1975 U. S. industry will be purchasing zinc to the tune of $400-million a year. Since the anticipated U. S. industrial use of zinc at that time will be at the level of about 1.4-million tons per year, there is indicated a price level of 14.3c or, say, 14.00 to 14.50c a pound.

Imbalances Are Expected

Over such a long period as 18 years, there are bound to be times of shortage and of oversupply in the world zinc market, just as there have been in the past. Our projection figures as of the year 1975, therefore, are not meant to estimate specifically the pertinent figures for that year but rather to indicate a level at about which such data may be expected to fluctuate around that time.

During our research we compiled a list of all the changes in the U. S. tariff which have occurred during the past 100 years. We include it here with the thought that it may be of some historical interest, in view of the present agitation of an increase in the present tariff rate.

U. S. A. Rate of Duty on Slab Zinc 1846 to date

Year	Slab per pound
1846	5% ad valorem
1875	4% ad valorem
1861	1.00c
1864	1.50c
1873	1.50c
1890	1.50c
1894	1.00c
1897	1.50c
1909	1.375c
1913—(Underwood)	15% ad valorem
1922	1.75c
1930—(Hawley-Smoot)	1.75c
1939—1/1—Regular Trade Agreements: Canada & U.K.	1.75c 1.40c
1943—1/30—Mexico	.875c
1951—6/6—Torquay	.70c

Whatever may be said of the effect of these varying rates of duty throughout the years in keeping in production U. S. marginal mines (production which otherwise might have been imported), the conclusion is unavoidable (Chart II) that U. S. industry, over any appreciable period of time, pays for the zinc it requires a sum of money not far out of line with its payments for the general run of all the basic commodities it requires.

THIRTY-THREE papers, covering crushing and grinding, classification, hydrometallurgy, chlorination, gravity concentration, magnetic separation, roasting, and flotation practice were presented in Stockholm's Concert Hall auditoriums.

Stockholm Spotlights Process Trends

CURT AGREN

METAL AND MINERAL PROCESSING got a real going over at the second International Mineral Dressing Congress in Stockholm, Sept. 18 to 21. Crushing and grinding theory and practice, classification, solvent extraction, leaching, gravity concentration, magnetic separation, roasting, and flotation all came in for their share of attention in four days of speeches, seminars and relaxed get-togethers.

Mineral processing engineers from all over the world attended and participated. Sweden, the host country, furnished the largest number of delegates, with Germany (110), France (44) and Italy (30) next in order. The U.S., U.K., USSR and Yugoslavia sent up to 20 members each.

Opening ceremony took place in Stockholm's famed Concert Hall where the guests were greeted by the president of the honorary committee Mr. Evert Wijkander, who is also president of Sweden's more than two hundred-year old Jernkontoret—a mining, iron and steel, and financial association.

E. W. Pehrson, foreign division, U.S. Bureau of Mines, presented an introductory speech loaded with facts and figures on the developments of the world's mineral resources and the endeavors of the metal and mineral processing engineer to eke out supplies for a rising world-wide standard of living.

OPENING the sessions fell to E. W. Pehrson from U. S. Bureau of Mines.

Mr. Pehrson's remarks formed a most interesting survey of the present situation, especially in regard to copper. He estimated the world's present copper reserves at 225-million tons of metal—which if consumed at the present U.S. per capita rate would last for only another ten years.

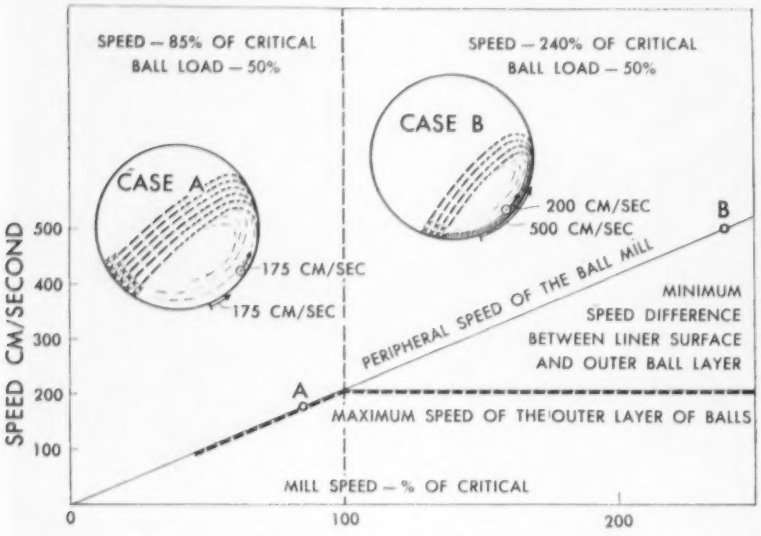
However, he estimated that there was enough to last 70 years at the current world rate of consumption. According to Pehrson, the solution to the copper resources problem lies in finding ways to use the large low-grade deposits that are not worth mining at present metal prices.

He showed that new metal and mineral processing techniques have made available for practical use a great many new minerals. Whereas only 35 minerals were needed to support the U. S. economy in 1870, more than 100, most of which are indispensable to modern industry, are now needed. He particularly stressed beryllium and its potential importance to the aircraft industry.

Mr. Pehrson ended his remarks by pointing to the international aspect of the scientific work to be presented by the participants at the congress, and said that no political or national barriers ought to be allowed to hamper a full, world-wide cooperation in the mining, metal, and mineral industries.

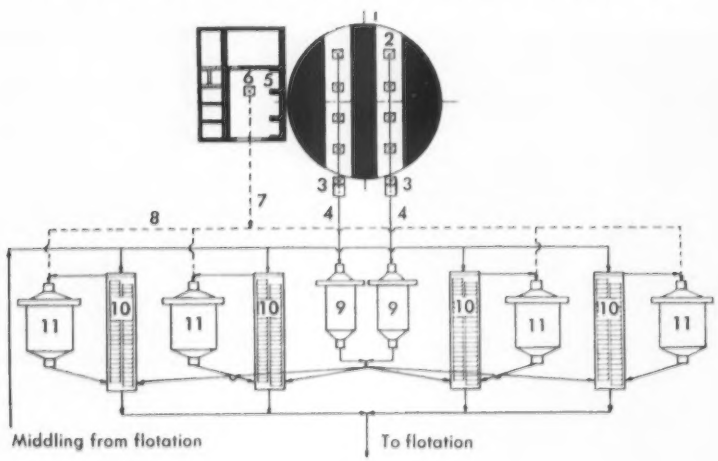
Panel discussions that ensued in the following days were lively, but added no spectacular news to that contained in the 33 papers presented by the delegates. New techniques were disclosed and new ideas kicked around. Flotation received special attention

Mr. Agren is correspondent, McGraw-Hill World News, Stockholm, Sweden.



GRINDING at supercritical speeds can increase rod and ball mill output due to the creation of a new grinding zone—a zone of intense attrition caused by ball slippage. The amount of attrition and the increase in grinding capacity rise with mill speed.

OUTOKUMPU CO.
OUTOKUMPU, FINLAND
KERETTI CRUSHING AND GRINDING FLOWSHEET



LEGEND

1. Fine ore bin—6000 tons
2. Eight draw chutes with belt feeders, 600 mm
3. Two recording weightometers
4. Two belt conveyors, 600 mm
5. Ore pebble bin—1000 tons
6. Vibrating feeder
7. Belt conveyor, 450 mm
8. Pebble hopper and track
9. Two rod mills, 6x12 ft
10. Four rake classifiers
11. Four pebble mills, 9x12 ft

from the delegates with Frank McQuiston's (Newmont Mining) "Flotation of Complex Ores" and P. G. Kihlstedt's "Flotation With Tall Oil Emulsions" attracting the most attention.

Bruce Clemmer's (USBM) "Solvent Extraction in Processing Uranium Ores," G. Bjorling's (Stockholm Royal Institute) "Reductive Leaching of Ores," S. I. Mitrofanov's (USSR) "Selective Flotation in the USSR," and M. A. Ejgeles's "Selective Flotation of Non-Sulphide Minerals," all to be discussed below, provided additional high points to the meeting.

Most of the foreign (to Sweden) members of the congress left on Sept. 22 on a 4-day excursion to Swedish, Norwegian and Finnish mines and mills to study ore dressing methods first hand. Probably the most imposing object of the tours was the new ore dressing plant at Kiruna above the Arctic Circle, which has a capacity of 14-million tons of high-grade iron ore per year.

Over half of the delegates were accompanied to Stockholm by their wives and other family members. A much appreciated feature of the ladies' program was the arrangement that every foreign lady guest be invited to the home of one of her husband's colleagues.

Next assembly of the congress is to take place in London in 1960. Task of organizing such a program has been handed over to John Denyer, director, Cyanamid Co. of Great Britain, a member of this year's honorary committee.

Here and on the following five pages are some of the highlights of the papers presented at the meeting.

Crushing and Grinding

Jonas Svensson and Jakob Murks discussed their findings with their report on "An Empirical Relationship Between Work Input and Particle Size Distribution Before and After Grinding." "The experiments comprised the grinding of equal charges of the same feed under identical conditions for varying times. . . . In every grinding test, the grinding time and quantity of electrical energy supplied to the mill motor were measured, and determinations were made of the specific surface and of the particle size distribution of the mill products."

The results were startling—a bombshell for the grinding theorist. "These experiments revealed that the constant ratio between work input and surface area produced, as demanded by Rittinger's Law, was not generally valid. The theories of comminution evolved by Kick and Bond corresponded even less satisfactorily."

The authors modified Bond's Third Theory equation by adding an exponent "*m*" to bring the results in line with experimental data, then further modified it to provide a formula that does not relate work input to a particular particle size at a certain percentage passing. Their new formula is as follows:

$$E = E_\infty \left[\left(\frac{100}{km} \right)^m - \left(\frac{100}{kmf} \right)^m \right]$$

CHAIRMAN of the IMD Lars Berglund (right) converses with William Stephenson (Allen-Sherman-Hoff Pump Co.) at recess.

GREETINGS being extended by Prof. D. G. Kihlstedt, Royal Swedish Institute, to John Denyer (1960 Congress chairman).

This formula replaces k_{80} and k_{80p} of the Bond formula with *km* and *kmf*, the logarithmic mean particle sizes of ground and raw feed. "An important advantage of the new formula is that no correction of *kmf* need be made, even if the feed should happen to be a screen fraction. Moreover, in the authors' experience, this equation is in closer agreement with experimental results than the Bond Theory or the modified Bond formula."

Grinding at supercritical speeds can increase production, according to R. T. Hukki, who reported that tests were conducted on ball mills with balls only, rod mills with rods only and both mills with media and feed.

On the drawing on p 80, Point A represents present grinding practice at a relatively high speed (85% critical) and with a ball load of about 50% of mill volume. At that speed, any point on the liner surface travels at a speed of 175 cm per sec. The outer layer of balls will follow the liner under these conditions without appreciable slippage. Thus, any ball resting against the mill liner will travel at 175 cm per sec.

In condition A, both the balls and the liner are traveling at the same speed in the same direction—no grinding can take place between the balls and the adjacent liner. All grinding in this mill takes place due to cataracting, cascading or tumbling, and attrition within the mass iself.

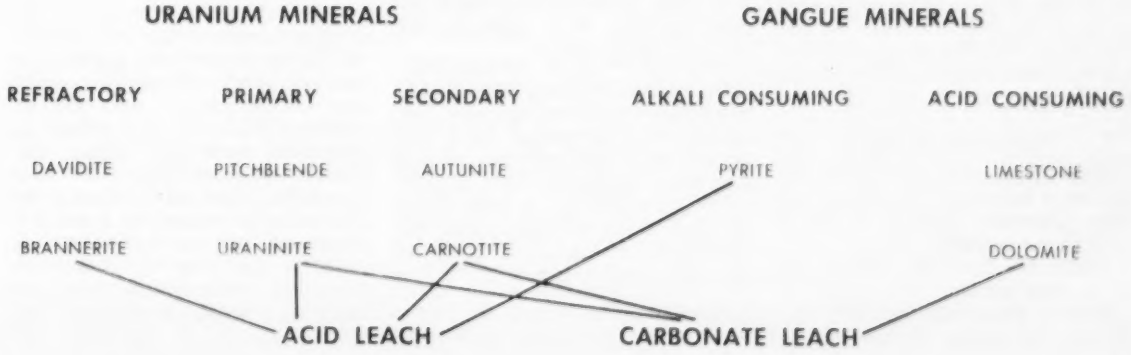
In condition B, grinding is at a speed 240% of critical with a ball load only 15% of mill volume. Peripheral liner speed is 500 cm per sec. Since the balls did not centrifuge, their speed at the outer ball layer must be under 210 cm per sec (the peripheral reference speed of the liner surface at the theoretical critical speed). Here the balls and the liner move at different speeds and a new grinding zone has been created—a zone of intense attrition.

This difference in speed between the mill liner and the outer ball layer is remarkable at high speeds. In a mill two meters in diameter, the corresponding minimum speed difference at 1000% of critical is about 100 kilometers per hour! "The sensation created by watching a ball mill run at 313% critical speed is comparable to that when driving a car at its maximum speed. When the mill and the car are lowered to their conventional restricted speeds of say 80% critical and 50 mph, the feeling is that they both have just about stopped."

Essential features of supercritical grinding are—(1) grinding in the new zone is a function of the slippage of the charge; (2) weight of the media charged must be selected so that the frictional forces developed between the charge and the liner is not sufficiently high so as to cause the balls to centrifuge; and (3) the amount of attrition grinding in his new zone increases with increasing mill speed.

Smooth liners increase the supercritical effect. Mills run at supercritical speeds must be well balanced.

How to Pick the Uranium Leaching Method



CONGRATULATIONS from J. Hedlund, general secretary of the IMDC and managing director, Association of Swedish Mines, to E. W. Pehrson following his speech.

Keretti concentrator at Outokumpu, Finland, changed their grinding circuit from a steel ball to ore pebble media. Ball load was 35% and weighed 25 to 30 tons. Pebble charge is 55%, but only 14.5 tons. System shown in the drawing on p 80 replaced one rod mill, seven ball mills and two Noranda-type classifiers. Circuit now grinds 100tph. While the pebble milling circuit has only operated two months out of the two years that the new concentrator has been running, the comparative operating costs are much lower.

Pebble mills operate at higher grinding capacity if the pulp is kept dilute, so mill density is cut from 60 to 40%. Circulating load is kept as high as possible. They noted that pebble mill capacity is a function of mill speed—the higher the speed, the higher the grinding capacity. Capacity increases as a power function of speed with an exponent value of 1.4.

Pebble mills at Outokumpu demand less horsepower, probably due to smaller grinding charge, so energy requirement was dropped from 290 to 150kw. Outokumpu pebble mills roll at 20 rpm. Higher speeds have been tried, up to 104% critical. At the later speed, the feed scoop rotated at 129% critical and caused feeding difficulties.

Hydrometallurgy

In his "Applications of Solvent Extraction in Processing Uranium Ores," Bruce Clemmer (USBM) illustrated some of the solvents.

Amines are the most selective and the quickest acting.

Dodecyl phosphoric acid (DDPA), although fast acting, requires slightly more mixing time than the amines. It is the cheapest of the three mentioned here and gives the highest ratio of concentration. A considerable quantity of solids can be tolerated without excessive reagent loss.

Di-2-ethylhexyl phosphoric acid (EHPA) requires longer contact time and more intensive mixing than DDPA or the amines, but its separation phase is faster. Influence of pH and temperature is about the same on all three. EHPA's selectivity lies between DDPA and the amines.

Present bar to solvent extraction on a natural pulp or slurry is the high entrainment loss that occurs. Some factors which influence entrainment are: (1) mixing time must be just adequate to give good extraction and no more; (2) ratio of organic to water phase must be high to minimize emulsification; (3) organic sulfonates will help reduce surface tension of the slurry; and (4) finally, pre-baking the ore at under 400 deg C will destroy the hydrophillic properties of some clays and reduce entrainment. According to Clemmer, entrainment losses increase with increased solids content—20% solids will lose about one gallon per ton; 50% solids entrains 10 to 20 gal per ton.

On uranium milling, Erik Svenke provided a sketch that will help pick the best leaching method (see p 81). He also added one important outlook item to the conference. Acid pressure leaching of uranium is being tested with the desire to bring about the auto-oxidation of the pyrite in the ore so as to generate sulphuric acid.

$$FeS_2 + 3\tfrac{1}{2}\ O_2 + H_2O \rightarrow FeSO_4 + H_2SO_4$$

[We wonder if this method might apply to Blind River ores, where the pyrite content runs as high as 25%. —Ed.]

Manganiferrous limonite can be leached with dilute sulphuric acid in the presence of pyrrhotite as a reducing agent, reports G. Bjorling, who added that the manganese sulphate liquor can be processed to yield electrolytic manganese and recycle acid.

$$3Mn_2O_3 \cdot H_2O + 2\ FeS + 6H_2O \rightarrow 6MnSO_4 + 2Fe(OH)_3 + 2S + 6H_2O$$

Mr. Bjorling said that patent application has been made on a similar process that takes the Fe $(OH)_3$ from above, adds scrap iron or more FeS, leaches with acid, and produces electrolytic iron.

Fluidized bed roasting of bulk sulphide concentrate at Dowa Mining Co., Japan, in a 20-ft dia Dorrco FluoSolids reactor at 700 deg C was detailed by J. D. Grothe and B. H. McLeod. About 99.75% of the calcine is recovered in the process, leached to dissolve the copper and zinc, then floated for the gold, silver and residual copper-zinc. Copper and zinc are electrolyzed for metal recovery from a single electrolyte (see *E&MJ* Reprint No. 512).

Chlorination can solve some of the complex sulphide ore problems, say H. Hohn, G. Jangg, L. Putz and E. Schmiede. Low-temperature working conditions, high yield and sharp separations were cited by the authors as the essential characteristics of chlorine metallurgy. They described the process flowsheet used by Mitterberg Mining Co. to treat pyrite-arsenical nickel concentrate from Muhlbach am Hochkonig.

Flowsheet shown opposite details the process which is very much like that patented by Swinburne and Ashcroft, and used at Broken Hill in 1897, except that Mitterberg deliberately adds air to oxidize the iron chlorides to iron oxide.

[We think that New Brunswick ores might be amenable to dry chlorine. As the authors of this paper point out, not much chlorine is actually used in the process, since the air oxidation produces a final product of chlorinated nonferrous metals, elemental sulphur and iron oxide. New Brunswick could take advantage of all of these products. For a full discussion of chlorine metallurgy, see Liddell's *Handbook of Nonferrous Metallurgy, Recovery of Metals* published by McGraw-Hill Book Co., 1945.—Ed.]

Jigs and Magnets

Using spherical, uniform particles, H. Kirchberg and W. Hentzel found that for every jigging operation there is a maximum height of upstroke to the point where the deposit is loosened through the harmonic pulsation of the medium. If the height is too great, the loosening wave cannot penetrate up to the top level of the bed.

The upper layers are either insufficiently influenced by the jigging action or not at all, and this inevitably leads to faulty extraction. For every material there is an optimum figure of height and rate of stroke.

Dry magnetic separation is more efficient than wet, states Urmas Runolinna. At Otanmaki, ore is dried to less than 0.5% moisture, and then small amounts of fatty acids are added to the dry grinding circuit to disperse the fines. Key steps to good magnetic separation are—high field strength and variable roll speed. Magnetic attraction can be offset by centrifugal force created by the peripheral speed of the rolls.

Roasting Iron Ores

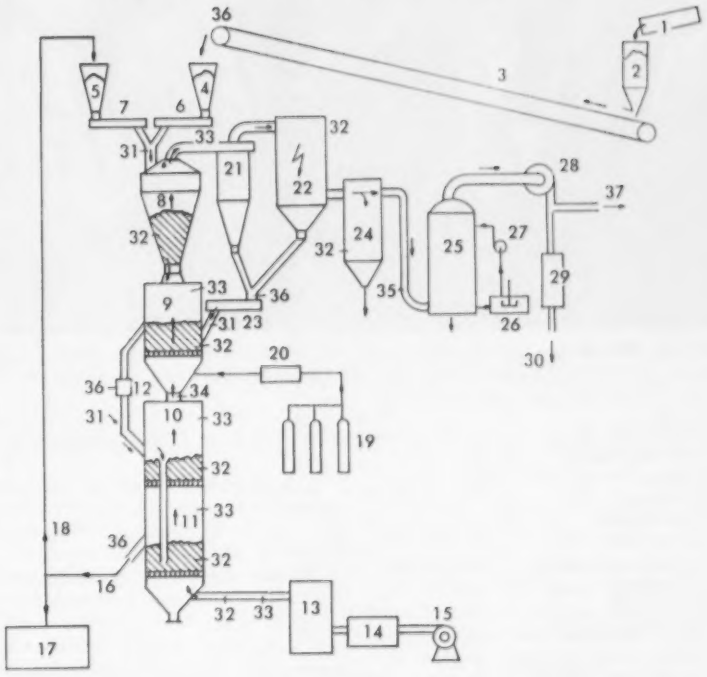
Magnetic roasting of hematite is being done in a recuperative furnace which permits heat transfer between the in- and outgoing feed without need for a heat transfer gas, according to Sven Eketorp.

The new furnace was designed and constructed at Stora Kopparberg Bergslags AB. In operation, ore is fed into the center of a revolving furnace having two different sections: one for roasting and the other for heat exchange. As shown in the drawing on p 84, the heat exchanger is made up of many small compartments surrounding a central feed compartment.

Incoming ore travels through the central compartment of the heat exchanger where it is preheated before entering the roaster section. After roasting, ore drops into the outer shell of the furnace and moves back through the small compartments of the heat exchanger, transferring heat to the incoming feed before leaving the furnace.

Outgoing calcine has 100 to 150 deg C temperature, even though the temperature in the roasting compartment is over 900 deg C. Furnace shown here has been in operation for ten months. It has a 750 mm inside diameter. Heat exchanger is 1,000 mm in length, while the roaster section is 800 mm. Capacity is 250 kg/hour at 15 rpm.

MITTERBERG MINING CO.
AUSTRIA
SULPHIDE CHLORINATION FLOWSHEET



LEGEND

1. Rotary drier
2. Bunker for dried pyrite
3. Conveyor
4. Charging dried pyrite
5. Charging of return
6. Screw conveyor, heated
7. Screw conveyor, heated
8. Venturi reactor
9. Fluidized bed reactor
10. Fluidized bed reactor
11. Fluidized bed reactor
12. Lurgi system shut-off device
13. Air heater
14. Air drier
15. Blower
16. Discharging roasted residue
17. Leaching
18. Return line
19. Steel cylinders for chlorine
20. Chlorine evaporator
21. Cyclone to separate dust
22. Electric gas cleaner
23. Dust return
24. Sulphur condenser
25. Scrubber for $AsCl_3$
26, 27. Agitator, pumps
28. Blower
29. Return gas drier
30. To return gas line
31. Scavenger nitrogen
32. Temperature control points
33. Pressure control points
34. Oxygen control device
35. SO_2 control device
36. Solids sampling
37. Waste gas discharge

New furnace is under construction with a longer reduction zone to cut down iron loss in the tailings being experienced in the present design. An air inlet will be installed at the feed inlet and outlet end of the new furnace to further preheat the incoming feed by igniting unburned gases. This will preheat the ore almost to 700 deg C. Present design permits a 95% recovery of the roasted iron, and the author hopes that the new furnace will permit a 97 to 98% recovery.

Floating Complex Ores

Frank McQuiston presented a paper that surveyed current complex sulphide flotation practice in many areas of the world. He discussed the following mines.

Mine and major mineral	Method	Pb-Cu ratio
Buchans (chalcopyrite)	SO_2	2 : 1
Idarado (chalcopyrite)	NaCN	1 : 1

SOCIAL HOUR brought together Ralph Utt (Western Machinery), Mrs. E. W. Pehrson, Mrs. and Mr. Frank McQuiston (Newmont Mining) and C. F. Zeuch (Dow).

San Francisco (chalcopyrite)	SO_2	5 : 1
Casapalca (varied)	SO_2	4 : 1
Mahr Tunnel (chalcopyrite)	NaCN	2 : 1
Tsumeb (tennantite)	NaCN	2 : 1

McQuiston separates these ores into three groups—unaltered, coarse, free sulphides such as those at Idarado and in the Chihuahua district; unaltered sulphides with important copper like Buchans and Cerro de Pasco; and altered and oxidized sulphides such as those found in the lower mine tunnel at Tsumeb.

Buchans ore is complex, fine-grained, with chalcopyrite, galena, sphalerite, gold, silver, pyrite and other sulphides. Buchans takes a bulk sulphide at 35% solids into an SO_2 tower. Tower discharge is conditioned with sodium bichromate for twenty minutes to depress lead. Lime is used to hold pH at 5 for the copper float. Reagent consumption is 1.5 to 2 lb SO_2, and 3 to 5 lb bichromate per ton.

A semi-bulk concentrate produces a rougher copper-lead, high in sphalerite and pyrite, which is subsequently cleaned in five stages with cyanide.

Idarado ore occurs in quartz with unaltered sulphides. Cyanide-zinc complex is used to separate copper and lead, since straight cyanide dissolves gold, silver and soluble copper.

According to McQuiston, the most effective compound for depression of chalcopyrite at Idarado is the complex reagent. American Cyanamid 675 is also good. Cyanamide consumption depends on copper in ore—about ½ lb per lb copper in a bulk concentrate, although Idarado's reagent consumption is 6 lb cyanide complex on a 6% Cu bulk.

Arsenopyrite can be separated from pyrite with the aid of pyrolusite, reports S. I. Mitrofanov (USSR). At Darasum concentrator, the following practice is applied:

Activated charcoal is added to the bulk concentrate to remove excess organic reagents, and then the finely-ground pyrolusite is added as the concentrate enters staged conditioners. Contact time is two hours.

A lead-copper-pyrite concentrate is made with arsenical material remaining in the underflow. Charcoal consumption is 1.7 kg/ton and that of pyrolusite is 5 kg/ton.

Mitrofanov also reported that barite can be separated from scheelite in an acid circuit with alkyl sulphates. In addition, he said that laboratory work shows that alkyl sulphates can separate fluorite from hubnerite and wolframite.

M. A. Ejgeles (USSR) discussed selective flotation of non-sulphides. He gave examples (including reagents, flowsheets and results) on fluorite-barite-malachite, fluorite-barite-hydrogoethite, calcite-fluorite, calcite-apatite, and diaspore-pyrophyllite.

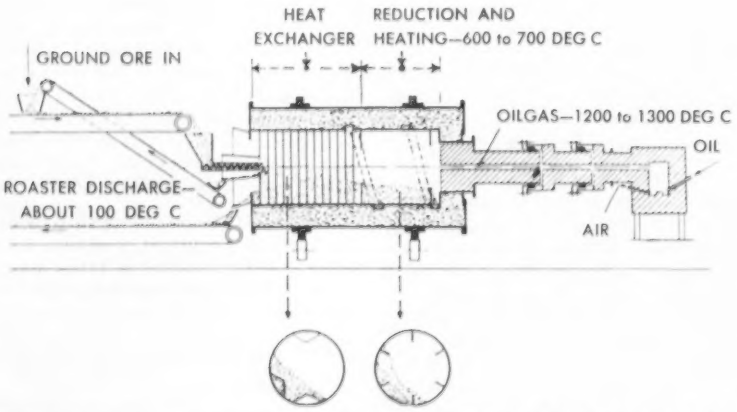
Flotation of hematite at the pilot plant of the Institute of Mineral Dressing, Royal Institute of Technology, Stockholm, is done with tall oil-fuel oil emulsion, according to P. G. Kihlstedt. See flowsheet opposite.

Ore is crushed and ground to minus 4 mm at 150 kg/ hour with 1-in. rods in a rod mill. Then fine grinding takes the feed down to 0.3 mm. Hematite is floated at pH 6 in roughers; the pH dropping down to 4 in the cleaners. Reagents are an emulsification of tall oil (600 g/ton) and fuel oil (1200 g/ton).

In the apatite circuit, the pH is held at 8.7 and the flotation reagents are emulsified tall oil (300 g/ton), fuel oil (600 g/ton) and sodium silicate (200 g/ton).

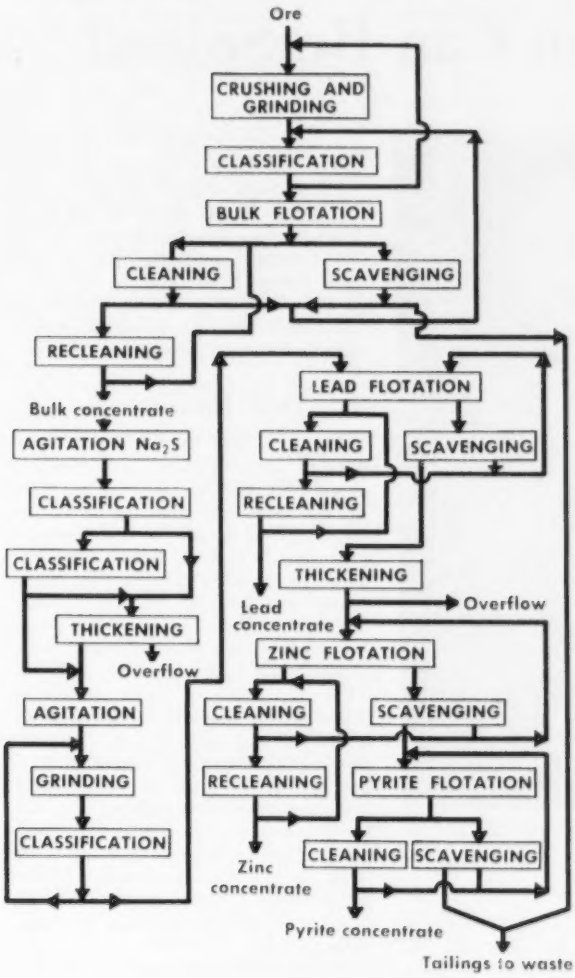
Desorption of flotation reagents from bulk sulphides was studied by A. S. Konev and L. B. Debrivnaja. Reporting on the techniques developed at Leninogorsk concentrator, they said that the method was developed and proven in a 300- and later in a 1500-tpd pilot plant. Present concentrator capacity is 7,000 tpd, as shown in the flowsheet opposite.

Ore is ground to 45% minus 200 mesh and a bulk concentrate taken. Bulk is conditioned with 10% sodium sulphide in three stages to displace the collector from the metal sulphide surfaces. Then the concentrate is dewatered and reground to 90% minus 200 mesh, with cyanide and zinc sulphate added to complex any remaining collector.

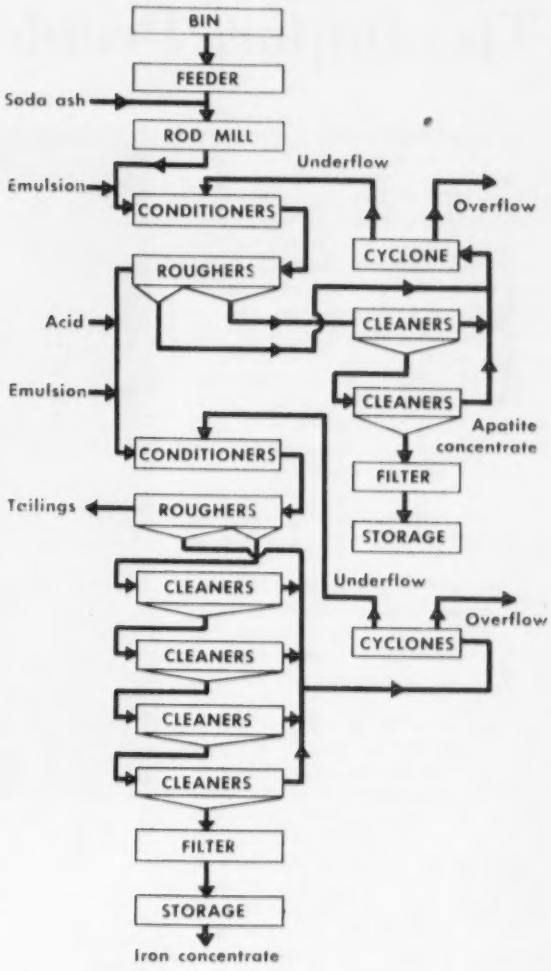


MAGNETIC roasting of hematite is done at Stora Kopparberg Bergslags AB in a Domnarfvet rotary, recuperative furnace. Method picks up sulphur to some extent.

LENINOGORSK CONCENTRATOR
BULK SULPHIDE FLOTATION FLOWSHEET



HEMATITE SELECTIVE FLOTATION
PILOT PLANT
ROYAL INSTITUTE, STOCKHOLM, SWEDEN



Method works so well that no froth appears on the thickeners between the conditioners and the cleaner cells. Lead losses have been cut in half and zinc losses reduced by 150%. Lead concentrate tonnage is 7% higher than previous method. Zinc tonnage is up 4%. Grades increased and total operating costs were dropped by 25% with a major saving in reagent costs.

And so it went—new ideas, new techniques and new friends were gained.

Bibliography

Ban, Thomas E.—Agglomeration of Hematite Concentrates Using Updraft Grate-Firing Techniques. 22 pp

Bellavita, Giuseppe and Antoniolli, Roberto—Jig Concentrate and Flotation Concentrate as Heavy Media at the Two Huntington-Heberlein Sink-Float Plants of the Montevecchio Co. 22 pp

Bjorling, G.—Reductive Leaching of Ores, Especially Manganese Ores. 5 pp

Bogdanov, O. S., Hainman, V. Y., Podnek, A. K., and Janis, N. A.—Investigation of the Action of Modifying Agents in Flotation. 13 pp

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Levin, J.—Flotation of Uranium From the Gold-Uranium Ores of the Witwatersrand and Orange Free State. 34 pp

McQuiston, Frank W.—Flotation of Complex Copper-Lead-Zinc Ores. 10 pp

Mitrofanov, S. I.—Solution of Some Problems Concerning the Theory and Practice of Selective Flotation in the USSR. 20 pp

Mitrofanov, S. I. and Kusnikova, V. G.—Adsorption of Diethyldithiophosphate and Butyl Xanthate by Sulphides. 14 pp

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Runolinna, Urmas—Dry Magnetic Separation of Finely Ground Magnetite. 25 pp

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The Import Problem Can Be Solved

ANDREW FLETCHER

EVEN THOUGH you may not be directly involved in the current discussions of imports and tariffs as they affect the domestic lead-zinc industry, I shall try to point out that the problems of lead and zinc are, or soon may be, your problems as well, and to suggest a solution to them.

The lead-zinc industry's difficulties are by no means unique. We in the industry have only run into them a little sooner than have most other producers of raw materials, but the problems we face now will in time confront, for example, domestic producers of steel and aluminum as well.

I should also like to point out how Government action, aimed at helping an industry, can seriously endanger that industry's very existence. To those of you who are interested in producing raw materials other than lead and zinc, let me suggest that it can happen to you, too. To those of you who are consumers of raw materials, I will point out that the prices you pay for such materials can be too low for your own good. To all of you, I hope to show that the problems of the world are crowding at your doorstep and, however closely you may be concerned with local affairs, you cannot entirely ignore foreign situations.

Lead-Zinc In Oversupply

Perhaps austerity is a good word for what we face in the lead-zinc industry. Please understand me. Nothing is inherently wrong with either of these excellent metals or the products made from them. There is simply too much lead and zinc readily available. Let me point out briefly how this came about.

A great upward surge in worldwide demand for metals, caused by the Korean War, faced lead and zinc producers just as they were climbing out of the pit of low prices into which they had dropped in 1949. Although production was expanded all over the world, to and beyond reasonable limits, there was no satisfying the estimates that Government officials thought were needed, and world metal prices climbed sharply. I might add that I, personally, as well as other St. Joe officials, repeatedly said that there was ample lead and zinc available for all necessary requirements.

"A stable lead-zinc price aids the producer, the consumer, and the nation."

I would like to call your close attention to the behavior of lead and zinc imports during this period and in the years since. In 1951, at the peak of the Korean crisis, when the United States needed metal, imports of zinc and lead dropped 40% and 60% from the 1950 levels simply because it was more profitable for foreign producers to sell their metal in markets outside the U. S. This was because our Government imposed stringent price controls on lead and zinc, whereas foreign producers were permitted to sell in the best market possible. In 1952, demand in these foreign metals had evaporated and metal flooded back toward U. S. markets in search of dollars. Imports of zinc rose 270% in 1952; imports of lead rose 280%, both to all-time highs. By 1953, the U. S. price of zinc dropped from 19½c to 10c a pound, and the price of lead had fallen from 19c to 12½c a pound. Domestic miners could not meet this kind of competition and many of them gave up.

Tariff Recommended

In 1954, the U. S. Tariff Commission recommended to President Eisenhower that he increase the tariff on both lead and zinc, as he is permitted to do under the escape-clause procedure. Instead, the President chose to aid domestic mines by stockpiling surplus lead and zinc, thus building the Government's stocks well beyond the goals originally set for the strategic stockpile. Through 1955 and 1956, U. S. metal prices were thus supported at adequate levels, and U. S. miners did receive some benefit. But this aid carried the seeds of serious trouble. Assured of a market at what to them was a high price in the U. S., foreign miners held their output at high levels, and imports went right on climbing despite the efforts of our State Department to persuade foreign producers to reduce their exports to us.

The stockpile program actually absorbed world surpluses of lead and zinc for over two years, and supported world prices of lead and zinc at levels that discouraged consumption abroad, and encouraged shipment of metal to the U. S. Imports were driven still higher by the barter program, by which the Department of Agriculture sought to get rid of surplus agricultural commodities and replace them with foreign-produced metals and minerals—mostly lead and zinc, as it turned out.

To St. Joe and many other observers, it seemed that there had to be an end somewhere, and it came early this year. The Government could not go on forever indirectly stimulating world production of lead and zinc and absorbing the surplus. When Government buying and barter slackened, prices fell, and zinc and lead are today back at the 1953 levels,

Mr. Fletcher is president of St. Joseph Lead Co., New York, N. Y. Information in this article is adapted from an address to the Beaver County Branch of the Pennsylvania Economy League, Oct. 17, 1957.

which are uneconomic for all but the largest and most efficient U. S. producers and certainly not healthy even for them. In the four years since 1953, our operating costs have risen and the burden is thus the greater. You may ask, why do we not pass along these higher costs to the consumer? Why do U. S. lead-zinc producers have to sell their metal at a price that returns little or no profit? We are forced to sell on the basis of world prices because lead and zinc are international commodities that can cheaply be shipped. We do not have a choice.

No "Passing Along"

How different it is in the steel industry! I was very much impressed by the fine statement made before a Senate Committee recently by Roger M. Blough, chairman of the U. S. Steel Corp., but I was also somewhat envious of his position. He pointed out that U. S. Steel has not been able to pass rising costs along to steel consumers "in their entirety." He said that in July of this year, U. S. Steel faced about a 6½% increase in its total costs per man-hour and "to cover these costs in part, we raised our steel prices by an average of 4%." How wonderful it would be if we in the zinc industry had even that much freedom in determining our selling prices. Mr. Blough's statement mentions that since 1951, the price of services in the U. S. has gone up 21%, but the price of commodities is up only 2%. Between 1951 and 1955, the price of steel rose 14%. If we also take 1951 as the basis of comparison for zinc, today's price is 48% lower! With no intent to make odious comparisons, I cannot help being mildly curious as to what the steel companies would do if today's steel price were 48% lower than it was in 1951. Why can we not pass along increased costs as the steel people do? Simply because of the threat of imported metal that can always undersell us. A sentence in Mr. Blough's statement especially intrigues me. It is, "With American wage rates three times as high as those which are paid to steel workers abroad, we face increasing competition from foreign imports; and in certain product lines, their competition has cut heavily into our market." Imports are only a potential threat to Mr. Blough. To us, in the zinc industry, they are a crushing reality.

We have no present defense against excessive imports. Lead and zinc can always be produced more cheaply outside the U. S. than inside, and foreign producers are free to force their production onto the U. S. market or to withhold it, if they wish, to seek a better price elsewhere in the world.

Let me make clear, however, that I am not calling for an end to imports. Far from it. It is beyond the foreseeable capacity of U. S. miners to furnish all the lead and zinc needed by U. S. industry—although the U. S. industry did take care of our domestic requirements until after the depression in the 1930s. U. S. mines are now supplying about one-third to one-half of the lead and zinc consumed in the United States. The rest has to come from scrap and from imports. Obviously, imports are needed up to a certain level. The damage is done when imports go beyond the point of need, and swamp U. S. mines almost to extinction.

Lead-Zinc's Solution

Therefore, the lead-zinc industry does not ask for a tariff on imported metal that will apply at any and all price levels. The industry does not, and should not, want to prohibit imports. What we do seek is a device that will make it unattractive to flood the U. S. market with metals when prices are low, and force our mines to close down. It has happened to us in 1949, 1953 and 1957. It can happen again and again, until there is no longer a U. S. lead-zinc industry to be driven out of business.

At this last session of Congress, the Administration offered a suggestion that would have set up import taxes to be applied to lead and zinc whenever domestic prices fell below "peril points" of 17c a pound for lead and 14½c a pound for zinc. Above these points, no taxes or tariffs would apply. Below 17c for lead, the tax would go up to 1c for each cent drop in price to a maximum of 3c tax per pound for prices below 15c. The maximum tax on zinc would be 2c per pound for prices below 12½c.

The industry agreed in principle, because this method seemed an equitable and automatic means that would help to regulate metal imports. We did believe, however, and presented ample evidence in support, that the sliding-scale taxes should be on a somewhat higher basis. At the Senate Committee hearing, a proposal was made to eliminate the sliding-scale feature and to apply a flat 3c tax to lead and zinc when prices fell below the "peril points." In the end, however, the President again suggested that the industry apply to the Tariff Commission for relief under the escape clause. That is what the industry has done, and the Tariff Commission is bringing their former study up to date.

Unfortunately, the maximum relief that legally the Tariff Commission can give is a duty of 2.1c on zinc and 2.55c on lead, which is not sufficient, but they can also grant supplementary quotas. Quotas are complicated—duties are not needed above the peril points, so personally I am in favor of the 3c flat tax on metal imports below "reasonable" peril points, with 70% of such tax, or 2.1c on the metal content of concentrates and ores. Congressional legislation, however, will probably be needed for this protection. During World War II, we had the Premium Price Plan which was a non-uniform direct subsidy, and as the result of this unhappy experience, the industry is definitely opposed to this form of assistance — moreover, any subsidies from the Federal Government mean Government control.

Why Not Imports Alone?

You may ask, particularly if you are a manufacturer, why not depend on imports? Why not get raw materials cheaply? If imported metal can be produced more cheaply, let's import it.

For an answer to that, let's consider what might happen to St. Joe's Josephtown zinc smelter in Beaver County, Pa., if we were to allow it to become entirely dependent on imported zinc concentrates. At present, Josephtown does treat a large tonnage of imported zinc concentrates, but 50% of its supply comes from our mines in upstate New York. Suppose Josephtown were operating on nothing but imported concentrates, and suppose a situation again arose as it did in 1950 (as I feel sure it someday will) when foreign producers were offered higher prices elsewhere than we could afford to pay or be allowed to pay, because our Government again set ceiling prices. With no domestic source of raw material open to it, our Josephtown smelter would have no choice but to shut down. Our employees would be out of work, Beaver County would suffer a tax loss, relief expenses would go up, zinc consumers would lose metal, and the country would lose a significant part of a basic, and vital, industry. This is not theorizing on my part. This situation has arisen, not once but repeatedly, and it did not have the unhappy results I have pictured simply because Josephtown is not entirely dependent on imported concentrates.

Why the Consumer Needs A Domestic Mining Industry

Now, for Josephtown, substitute a domestic zinc consumer; and for imported concentrates, substitute imported zinc metal. Here is a consumer

of zinc who is now dependent on that low-priced foreign metal he found so attractive in the days when the U. S. zinc industry was being flooded almost out of existence by unneeded imports. For a time all goes well, but some day, not too far off, rising industrial demands abroad, or some emergency, will make it more profitable for the foreign producer to sell his metal outside the U. S. Our domestic consumer will then have the choice of paying a terrifically high price for lead and zinc or of giving up. Neither you nor I want either of those things to happen. They can best be avoided by keeping the domestic mining industry at as high a level as is economically justified, and by developing a control device that will encourage needed imports and discourage them when unneeded. The same problems will arise for steel, aluminum, and other items, and I believe the same type of solution can be applied.

Over two years ago, I spoke before a meeting of the Colorado Mining Association in Denver and cautioned consumers of lead and zinc not to be misled by the phantom attractiveness of temporarily low metal prices based on unneeded imports. I presented at that time a comparison of the cost to a consumer of regular purchases of lead and zinc over the previous five years based on the one hand, on prices as they actually were, and on the other hand, on stable prices at reasonably high levels. This comparison showed that the price fluctuations caused by the ebb and flow of imported metal had actually cost consumers of metals more than would have stable prices, at levels high enough to be profitable to most U. S. producers.

I have repeated this calculation but expanded it to include the last ten years. This covers three periods of rising and falling metal prices. If a consumer of lead and zinc had purchased five tons per month of each metal over the last ten years, and had paid the actual New York price for lead and the St. Louis price for zinc, he would have spent $184,842 for his lead and $157,972 for his zinc. During that period, the prices of lead and zinc rose and fell, sometimes quite rapidly, between lows of 10.63c per pound for lead and 9.32c per pound for zinc, and highs of 21.5c per pound for lead and 19.5c per pound for zinc. If these prices could have been stabilized over that period at 15c per pound for lead and 13c per pound for zinc—prices which would have been profitable for U. S. producers based on the costs for that 10-year period—our consumer of metals would have spent $6,814 less than he actually did, and he would have been spared the anxieties of trying to outguess commodity price fluctuations.

The lead-zinc industry believes that by establishing a tax on imports when the domestic price for zinc falls below 14.5c per pound and 17c for lead, a stability in metal prices would be obtained, which is for the best interests of the consumers. These prices would also result in profitable operations for the miners based on 1957 costs of production and anticipated costs in the immediate future.

A Lead-Zinc Program Beneficial To All

The interested groups can be subdivided into:

1. Foreign nations and miners. They have already started emitting screams of anguish—however, it is because they have not sat down and studied the program with pad and pencil. For the foreseeable future, the U. S. must import sizable tonnages of lead and zinc, and if our foreign friends would simply stop sending us more than was needed to meet the U. S. requirements, then the domestic prices must necessarily advance to the so-called "peril points" of the program, above which there is no tax or duty.

Assuming for the moment that the Administration's peril points are adopted, namely, 14½c for zinc and 17c for lead, these would then be the prices at which foreign production would be sold in this country, provided imports were not in excess of demand. Assuming further that U. S. consumption would be the same as in 1956, then the foreign producers would receive at the peril point prices for 85% of their exports to the United States practically the same amount as they received at the 1956 prices of 13c for zinc and 16c for lead, and certainly much more than they are now receiving at the 10c and 13c price levels due to excessive imports.

I cannot conceive why foreign miners or foreign nations can have any just complaint, when for 85% of their exports they would receive almost the same amount of money as they did in 1956. For example, in 1956, Canada, Mexico, Peru and Australia, who seem to be the principal objectors to an import tax or increased duty, had a value, in their exports of lead and zinc to the U. S. of about $260-million for the metal content in the 328,000 tons of lead and the 635,000 tons of zinc they shipped to us. This estimate is based on U. S. market prices less duty and without deduction of smelting charges. A comparative value on exactly the same basis at the proposed peril-point prices but for only 85 % of the metal content would be around $251-million. Actually the difference of $9-million might not be as great, because I have heard rumors that considerable tonnage of pig lead and slab zinc from these countries was sold in 1956 at discounts.

If, of course, the foreign miners do not reduce production by the 15% and dump it in the foreign market, they would reduce their proceeds from foreign sales—therefore, I would think that they would curtail.

2. Domestic miners. They would receive about peril point prices, and the domestic mining industry would be put on a profitable basis.

3. Consumers. They would of course pay more than they are at present prices, but their raw material costs would only be slightly in excess of that which they were willing to pay in 1956. The peril point prices would in reality be ceiling prices, as more than ample world production would be available at 14½c for zinc and 17c for lead—and as I have already indicated, what the domestic consumer really wants is a more stable market.

4. Our nation. The economy of the United States would certainly gain, and its defense would be helped by having a healthy domestic mining industry.

Keep Faith In Future

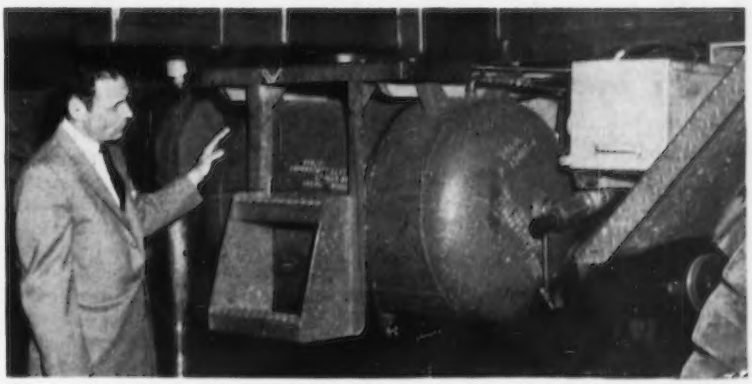
Having dwelt so long on our problems and troubles, I may have given you the opinion that the lead-zinc producer's outlook and attitude are acid in the extreme. Far from it, because I now believe that Congress, the Administration, and most of the metal consumers are convinced that a domestic mining industry is a necessity for the protection of the economy of the United States—and in fact, for their own selfish reasons. If you visit Josephtown tomorrow, you will find an enthusiastic hard-working crew engaged not only in routine production of zinc, but in such long-range items as a new 100,000-kw power plant, new furnaces, other expanded facilities, and intensive research aimed at new and improved production methods. St. Joe has faith in the zinc industry and in American industry under the private enterprise system that has made our country great, and we back it up with capital and with hard work. We have faith, too, that foreign miners will understand the U. S. position. The greatest opportunities for industrial production throughout the world still lie ahead of us.

SOUTHERN PERU COPPER CORP. is receiving a 90-truck shipment from Dart Truck Co. for use in the rugged and mountainous Toquepala and Quellaveco operations. Six 10-ton and sixty-nine 25-ton vehicles form the bulk of the consignment which will operate round the clock in the isolated Peruvian Andes.

ELECTRICAL MAINTENANCE of the trucks was a design bogey. Ingersoll-Rand air starters, installed on all the trucks, will eliminate much of it.

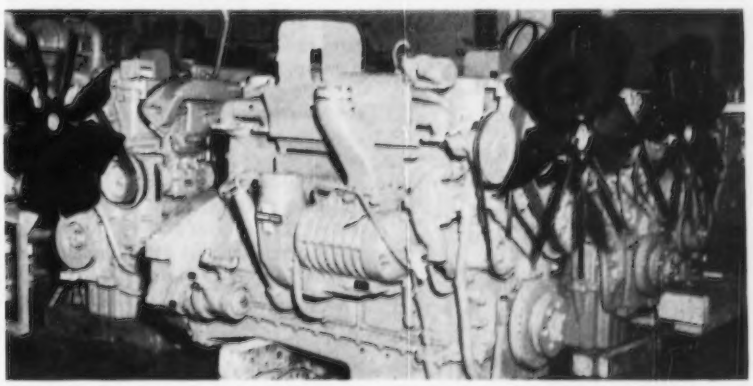
Toquepala's Trucks Face Isolated, Rugged Duty

PUSH BUTTON on the dashboard cuts in the I-R air starting motor. Installation is expected to cut battery replacement by 75%. Air is taken from the regular brake system's air compressor and four storage tanks.

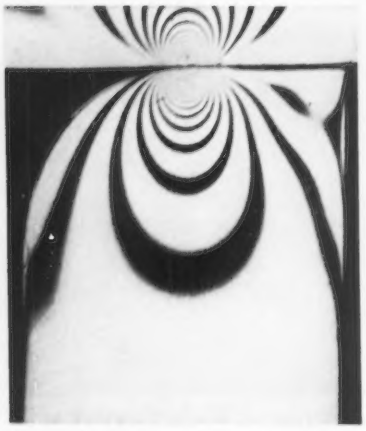


FOURTH SUPPLY TANK is extra, provides ample supply for the starting motor. Aeroquip hose connects tanks and compressor; tanks can be filled in shop or field if it proves necessary. Toquepala, due in 1960, first must remove 120-million tons of overburden to get to a 400-million ton 1% Cu orebody. First important phase of the operation, construction of a $3-million mole and pier at the port of Ilo, has been completed by Foley Bros. Construction, who are also in charge of stripping.

LUBRICATOR on the air line is a feature of the I-R 9BM unit, which cranks the 335hp Cummins diesel engine. Starter maintenance is low.

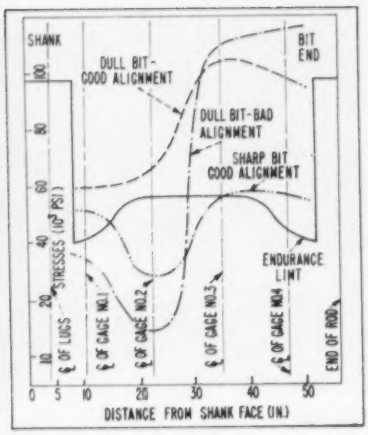


CUMMINS DIESELS are lined up at Dart's Kansas City plant prior to installation. Along with air starting motors, Toquepala's trucks also employ Fuller transmissions and Twin-Disc torque converters for downhill braking. Bulk of work on Toquepala, Quellaveco and Cuajone will be at altitudes ranging from 9- to 12,000 ft.



PHOTOELASTIC studies of shank show edge radius of 1/8 vs 1/32-in. cut stress 80% and practically eliminated chipping.

OSCILLOGRAM of stress pattern in rod during drilling is complex wave due to varying rock reaction and rod effects.



MAXIMUM TENSILE stress in rod during drilling is greatly affected by alignment of rod and sharpness of bit.

Percussion Drill Steel Life—

1. What Are the Factors?

LLOYD E. ANTONIDES

DRILL STEEL COST for percussion drilling probably averages about one cent per ton of rock mined. This seems small because it is based on steel purchased and omits rod handling and fabrication. Data is lacking on full cost, but obviously it would be considerably higher. Efforts expended by manufacturers and operators is evidence that rod life is an important element of drilling cost.

Service failure of drill rods is due to fatigue failure in surface layer, usually caused by tension stresses. Following this introduction, some leading researchers present ways of combatting failures.

The mechanism of failure in drill steel—like any polycrystalline material—has been explained in a simplified manner by Dr. T. W. Wlodek:

"When the magnitude of an externally applied dynamic load reaches a value which produces, along various atomic crystal planes, a shear stress that exceeds the elastic limit in shear, a local plastic deformation (slip on atomic planes) takes place. During this initial local plastic deformation, so-called strain hardening or cold-working appears. If the magnitude of resultant alternating shear stresses resolved along atomic plane of least resistance to slip is within certain limits, further slip is stopped and material shows no further local changes. This is safe range of stresses, and failure is not expected. [Ed.—This is the fatigue or endurance limit, usually considered one-half tensile strength.]

"If external alternating load exceeds the critical value, local plastic deformation is produced which exceeds the limiting range of crackless deformation. Small cracks or discontinuities result. During further alternating loading, these local cracks grow in number and size. If they reach a critical saturation a nucleus of fatigue is formed and eventually the material fails.

"Fatigue fracture of mining drill rods starts from a nucleus of fatigue, usually coinciding with point of expected maximum stress and local stress concentration. Failure continues progressively during cyclic loading until cracked portion breaks suddenly due to overloading. Area of fracture adjacent to nucleus is smooth because surface is rubbed by the oscillating tension-compression load. Fracture sometimes shows radially progressing circular rings with center in nucleus. Area broken last is coarser and more crystalline in appearance than first part."

There are several factors that influence this mechanism. On surface of mining drill rods, a large number of small pits, sharp notches and different irregularities of geometrical and metallurgical origin are formed during ingot casting and rolling. Because of their shape, they introduce large local stress concentrations which may range up to two or three times the normal stress obtained by direct measurements or by calculations. Values depend on radius (sharpness) of the root, and dimensions. Plastic flow may relieve the large local stresses during cyclic loading, but, if critical amount of mixed-up plastic flow under tension-compression stresses is exceeded, a nucleus of failure will be formed. Smoothing of the surface can counter this condition.

Surface decarburization, usually present in "as-rolled" rod, introduces a layer of lower mechanical strength as compared to the core. Recarburizing can correct this.

Geometrical shape, orientation and dimensions of connections, collars, markings, shank faces, etc., can cause high local stress concentrations. While complete elimination of all these elements may be difficult, reducing the angle and rounding the apex of any junction can help. As Floyd R. Anderson says, "It was soon learned in the development of carburized steels that mechanical design was of importance equal or greater than metallurgical refinements. Reverse buttress threads were found superior to lamp-socket type. Friction (taper or straight) type bit connections are preferred over lamp-socket threaded. External corners of shank striking ends, lugs and collars must incorporate generous radii to avoid early chipping in service." (See illustrations.)

Collarless rods can be used in drills employing an anvil block, e.g. stopers. But the block causes some loss in energy and pulling of rods must not be a problem. Friction-held detachable collars have also been reported in limited use. And, of course, an ad-

vantage of integral steel is the absence of any connections.

Metallurgical notches—soft, hence low strength, zone between heat-treated and untreated portions of steel—are an evil originating in the heating necessary for forging and machining shanks and bits. Kemsley (Trans. Australian IMM 1955) said he found 78% of rod failures occurred in such spheroidized carbide zones which also accentuate corrosion. These zones can be completely eliminated only by treating entire rod, although they can be "smoothed out" somewhat by "overlapping" the heating, i.e., heating an additional 3 to 6 in. of rod for 2 to 4 min before quenching. Fast quench for developing maximum hardness may cause surface cracking, too.

Residual stresses in the fabricated rod can have detrimental as well as beneficial effects on life. Residual tension stresses at surface aid formation of micro-cracks. For instance, Gardner-Denver found this to be reason heat-treated rod life for carbon was only one-fourth that for alloy, despite same hardness and no notches present. At AMC meeting in September, Mr. Anderson said that as a consequence of different reaction to heat-treat, pre-load tensile stress in surface of water hole—where failures of carbon rods originated—was 50,000 psi in carbon rods, as compared to zero in alloy rod—latter failed from outside.

Residual surface compressive stresses, on the other hand, will inhibit widening of micro-cracks due to tension. Ingersoll-Rand's cold "Jack-rolling" of undercut at beginning of threaded attachment has this pre-stressing effect. So do mechanical surface treatments, such as shot-peening and spiral-rolling. (See following pages.)

Water has a detrimental effect. Most obvious fact is that in its presence there is no fatigue limit. Moisture accelerates normal rust-pitting. In addition, its corrosive action is intensified by anodic conditions at points of local stress concentration. Many new pits are formed and old ones extended. Furthermore, impure mine water reduces surface hardness and other mechanical properties due to the Rehbinder effect of active surface agents penetrating deep into strained crystals. Raising corrosion resistance by changing composition can reduce water effects. Adding chemicals to water has also been suggested.

Abuse deserves emphasis. For instance, nicking results in local stress concentrations like any surface imperfection. Care is the answer.

With this mechanism of failure and some of the related influences in mind, the stress developed in a drill rod is worth at least brief consideration. The applied working stress is one of compression—impact of a hammer on the shank and reaction of the rock through the bit. Frequency of blows is 600 to 2500 per minute; energy per blow, 20 to 200 ft-lb. It now appears that 70 to 90% of the hammer's energy is lost between shank and bit due to joints, work of straining and damping effect of steel (Anderson—AMC September 1957).

Tensile stress is critical. The magnitude is shown in graph (from Anderson's discussion of paper by Dr. Wlodek in CIM Trans. 1952). Compressive and shearing stresses are of some interest. But torsion is of minor consequence because in percussive drilling rotation is meant only to index (turn) a free bit.

The shank face must not fail by chipping or plastically deforming under impact. On common percussion drill rods the area is sufficient to keep average stress below the yield limits of prepared steel. But on relatively thin tubing used with some drills, upsetting (plastic flow) does become a problem. Of course if stress is not applied to full area due to misalignment or mishape, any steel may be overloaded and fail.

In the rod, the compressive wave caused by the impact is a longitudinal type with the associated compression-rarefaction (tension) stresses. It travels about 16,000 fps. When it is reflected from face (bit or coupling end) it changes to a tension wave. Thereafter, as the waves travel back and forth a complicated pattern develops (see photo). Geometric and compositional irregularities add to the complexity. The damping effect of steel absorbs the wave's energy. Failure to adjust feed properly plays a large part in the detrimental effect of this vibration.

The rod-column may also bend under load if unsupported-length to width ratio is large. (See Dr. Shepherd's section on next page). In bending, the highest tension-compression stresses develop in outside surface. Misalignment, dull bits, hard rock or heavy blows accentuate the bending.

At the attachment, conditions exist which are a combination of those at the shank and in the rod-column and are very sensitive to geometry of design. Fretting (abrasion-corrosion) can be a problem. Close tolerances in fabrication and tight unions in assembly are important.

Composition and Heat Treat

Composition and heat-treatment have a major role in the drill steel story. Their effects are interrelated. Essentially, the mechanical or working properties of steel are based on the manner of distribution and the amount of iron carbide (cementite). Thus carbon is the principal compositional factor. Heat-treatment is a process of changing manner of distribution by varying rate of change as well as intensity of temperature.

Hardness (ability to resist indentation and abrasion) is an important property. Strength in tension, compression, shear and fatigue is proportional to it. Damping capacity is inversely proportional. Obviously then, higher hardness is the best single answer to greater rod life. But brittleness (lack of ability to deform without failure) is proportional to hardness, too. Unfortunately, this is detrimental because sudden stresses sometimes require that the limit of strain (deformation) be exceeded. Notch sensitivity (characteristic of marked weakening if nicked or pitted) appears likewise proportional to hardness.

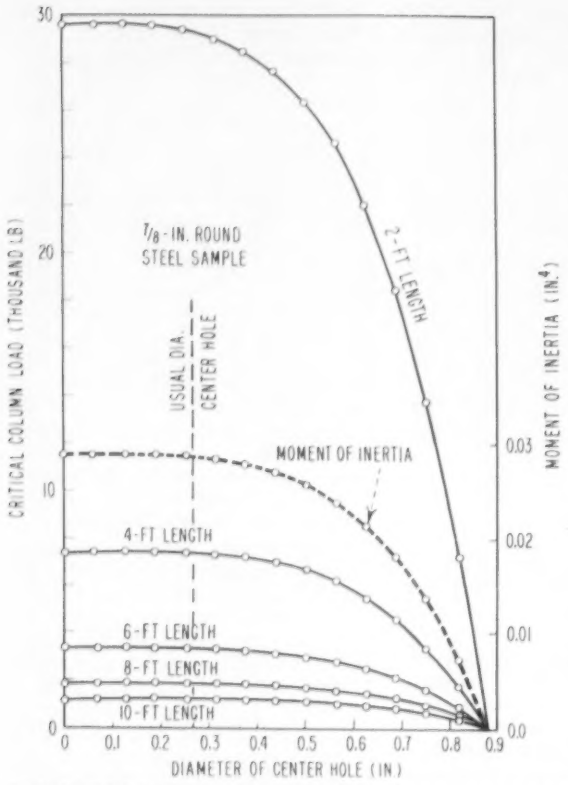
Heat-treatment procedure controls hardness actually developed in a given steel but composition determines maximum possible hardness that can be developed. Maximum possible hardness is a direct and practically solely a function of carbon content, at least up to 0.6% C. In general, fastest cooling produces highest hardness. Depth to which maximum hardness is developed in heat-treating (hardenability) is a function of how fast cooling penetrates the steel. Alloy content primarily governs this hardenability, although grain size and carbon content are also interrelated.

Adding alloying elements can also enhance or inhibit certain properties. Some of their effects are not clear but apparently their use can result in rods with higher as-rolled hardness, increased toughness (combined strength and "anti-brittleness"), reduced and less precise hardening temperature and cooling rate, lower corrosion susceptibility and probably less notch sensitivity. For these reasons alloy steels have come into wide use.

Metallurgical surface treatments, introducing carbon or nitrogen or heat-treating with flame (torch) or induction, raise surface hardness. They also leave surface under residual compression.

Mechanical surface treatments, on the other hand, are designed to raise rod strength by pre-stressing surface in compression. Some also smooth the surface and harden by cold-working.

Some of the recent developments are presented on the following pages. But one other that deserves mention is Atlas Copco's chemical surface treatment for alloy steel. The company reports that it provides enough corrosion protection to practically eliminate inside fractures and to substantially reduce outside fractures before being worn off.



MINIMUM LOAD that causes buckling in drill rods depends on moment of inertia and ratio of unsupported length to least dimension. Large center hole diameters cut load sharply.

Stiffness Is Proportional To Moment of Inertia

Shape	Size Hollow Drill Steel (in.)						
	¾	⅞	1	1⅛	1¼	1⅜	1½
	Moment of Inertia (in.4)						
Round	.0154	.0285	.0489	.0778	.1193	.1742	.2454
Hexagonal	.0189	.0349	.0598	.0953	.1458	—	—
Quarter-Octogon	—	.0456	.0786	.1261	.1843	—	—

Note: Deflection of carbon and alloy steel is same up to point wher steel takes a permanent set.

Stiffness of drill steel for a particular set of drilling conditions is directly proportional to moment of inertia. For example, 1-in. hexagonal steel is (.0598/.0489=1.224) 22.4% stiffer than 1-in. round steel.

Per Cent Alloying Elements In U.S. Drill Steel

Type	C	Mn	Si	Ni	Cr	Mo	BNH(a)
Plain Carbon	.75 −.85	.15 −.40	.10 −.30	.25x	.15x	.05	240
Alloy Cr-Mo	.90 −1.05	.20 −.45	.15 −.35	—	.90 −1.40	.17 −.45	321 477
Alloy Mn-Cr-Mo	.25 −.30	.80 −1.20	.50 −.80	.25 −.40	1.90 −2.40	.25 −.35	352 415
Alloy Ni-Cr-Mo	.17 −.22	.45 −.65	.20 −.35	1.65 −2.0	.40 −.60	.20 −.30	−(b)
Alloy Cr-Mo (Tubing)	.38 −.43	.75 −1.0	.25 −.35	.25x	.80 −1.10	.15 −.25	260 310(c)

(a) Brinell Hardness Number as rolled. [Ed.—In this range Rockwell C value is about 1/10 the BHN. Tensile strength is about 500 times BHN and Fatigue Limit is about ½ tensile strength.] (b) Special treatment. (c) Normalized and tempered

2. Modern Drilling Demands Special Steel

B. F. SHEPHERD

ROCK DRILLING by percussion method has expanded in recent years from hand and column held rock drills, through jumbos with many drills, to a complex variety of mechanical arrangements for supporting and feeding the drills. The length of hole drilled per steel, i.e., rod change, has been continually increased to provide uninterrupted drilling. It is common practice to utilize 10-ft changes even in hard rock. The more powerful "Quarrymaster" type of rock drills regularly use 40-ft steel changes.

This change in practice has been made possible by the detachable bit with carbide inserts. This extremely hard material loses gage very slowly and the relatively small amount of dulling per hole does not interfere with drilling speed or steel changes. A hole may be 'bottomed' at approximately starting gage.

The utilization of longer steels results in a much longer length of unsupported steel during drilling, so behavior of long, slender lengths under impact and torque becomes increasingly important. The bending loads placed on the steel, especially during the starting of holes, is very severe, more so on poor 'faces'. In addition, steel centralizers cannot be located to support the steel during starting with maximum efficiency on the more complex jumbos.

As the size of hole drilled increases, a larger amount of cuttings must be removed. There is, therefore, need for more adequate cleaning and the hole diameter in the drill steel must be increased in order to get the required amount of air or water through the steel.

Unfortunately, increases both in length of steel and in diameter of center hole each causes a sharp decrease in critical column load (i.e., minimum load to cause buckling). (See graph.)

Resistance to bending is proportional to the moment of inertia of the cross-section of the steel. Values for the common sizes are given in an accompanying table. As size of center hole increases, especially above that commonly used, these moments drop off rapidly. An example is shown on the graph (dashed curve). Similar curves can be constructed for any size steel.

The improvements in power of rock drills and cutting capacity of inserted carbide detachable bits cannot be utilized unless the drill steel can transmit the increased energy without undue breakage. To emphasize this point, the writer regularly uses the term 'connecting link' for drill steel for obvious reasons. Since the important phases of drill steel use, i.e., heat treatment, design, manufacture, mechanical treatment and control were covered in a symposium before the American Mining Congress, 1954, (reprints are available from Crucible Steel Co. of America or Ingersoll-Rand Co.), this article will discuss certain aspects of drill steel not covered by them.

The demand for optimum service has led to an increasing use of alloy steel for many operations. The types of steel commonly used are listed in the accompanying table.

Hollow drill steel is made by spe-

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cialized processes. In the late 20's, the austenitic core method started to supersede the 'sand core' and 'mandrel' processes used previously. Practically all small sizes of hollow drill steel are now made by this method. Production of a round hole within the usual tolerances of $\frac{1}{64}$-in. plus or minus nominal diameter with minimum eccentricity necessitates the use of specialized preparation and rolling technique. Many more passes are used than required for equivalent bar sections.

Maintaining proper size and shape of hole becomes more difficult as size of steel increases. And wherever upsetting is required, such as in fabricating attachments and shanks, hole shape becomes an important problem.

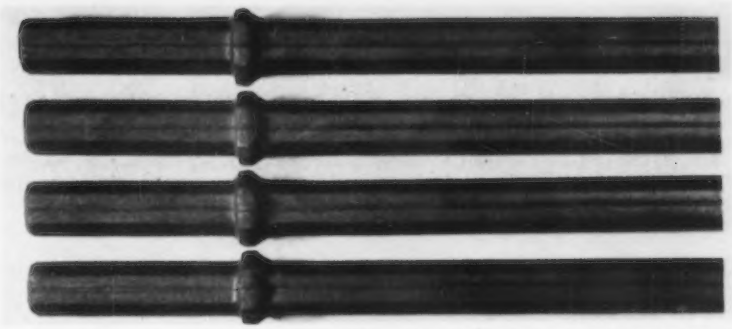
The large diameter steel required by "Quarrymaster" and 'down the hole' drills has so large a hole that the austenitic process cannot be used and the steel for those drills is made by conventional methods used for production of cold drawn steel tubing.

Water passing through the hole is sometimes so corrosive that the steel is cast around a stainless steel tube which is reduced in size as the steel is rolled. This improves the fatigue resistance by neutralizing the corrosion fatigue effect found in the unlined steel. This type of steel is extensively used in Africa.

Properties of steel of any given chemical composition may be affected by manufacturing variables both at steel mill and in mine shop. By far, the most important property is the ability of a steel to develop a desired hardness when cooled at a particular rate after heating. In the shop this permits proper hardening of shanks, integral bits and attachments after forging or machining. In the mill the rolling operation is controlled to develop a bar hardness which meets service requirement for the rod in general, i.e., for most of its length. If steel was in the annealed condition (i.e., soft, which is necessary for machining) it would not meet service requirements of high rigidity, high fatigue- and wear-resistance, low damping capacity, etc., and thus it would require involved heat treatment at user's level.

It would be disastrous to heat treat carbon steel with an alloy steel heat treatment and vice versa. This causes a natural reluctance for many operators to try alloy steel as its use must be confined to specified working places and a mix-up in the blacksmith shop would result in serious trouble. Identification is difficult by observation of the usual brand name, rolled on the steel at approximately 30-in. intervals.

To facilitate the introduction of alloy steel, the writer has utilized a shallow groove rolled along the entire length of the bar. This permits the steel to be identified easily. It is not destroyed by use and does not interfere with forging. It is used to identify the Mn-Cr-Mo type of steel. Modifications of this marking, such as an interrupted groove, coded, double groove, etc., could easily be utilized to identify other types of alloys.



FAST IDENTIFICATION of alloy steel is aided by grooving rod lengthwise. It prevents shop errors in treating as well as helps keep track of steel.

These Are Major Steels Used

Carbon Steel (SAE 1080) is still required for all drill steel with integral bits so that proper hardness may be obtained for cutting the rock. This requires a water quench which easily develops maximum hardness of 65-67 R_c (Rockwell Indentation Hardness, scale "C"). The shank end is usually quenched in oil and a comparatively wide range of temperature may be used with resulting hardnesses with the range of 350 to 425 BHN (Brinell Indentation Hardness Number) equivalent to 37 to 44 R_c.

The steel is controlled during manufacture to hardenability (depth to which material will harden when heat treated) standards of .235 to .295 as measured by the PV test. The hardenability at 1450 deg F as measured by the PF test should not be more than 13 on small sizes, 15 on large sizes, and not less than 8 to ensure hardenability. If greater than these values, the steel will harden file-hard to an increasing depth and area when quenched in oil. If less, adequate hardness will not be obtained when oil quenched.

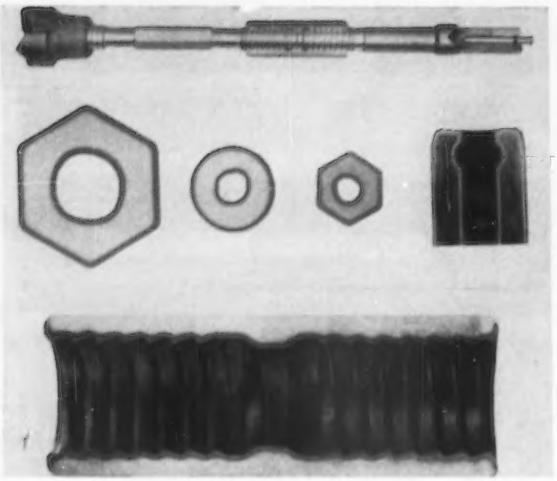
Alloy Steel Cr-Mo (modified SAE 52100) is one of the first alloy steels used for drill steel. S. K. F. Co. at Horfors, Sweden, manufacturers of many kinds of fine steels and drill steel in the late 20's, subjected alloy steels to test in their own mines. As they were manufacturing tremendous quantities of Cr-Mo bearing steel, this material was explored. Bits developed full hardness when quenched in oil and the steel came into wide use in Sweden.

Repeated attempts to introduce it in the United States failed because the steel was difficult to forge in Leyner shanks. In Canada, where shankless steel was common, the steel came into widespread use. The bar hardness as rolled was sufficient and no shank treatment was required. The steel is air hardening and easily develops 400 Brinell (42 R_c) when cooled in air from 1600 deg F.

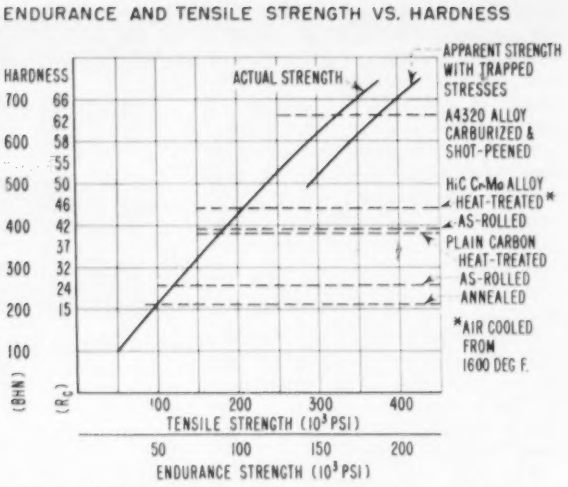
The hardenability is sensitive to chemical composition and temperature. If air-cooled from above 1650 deg F., the steel develops full hardness and becomes file-hard. As with most alloy steels, heat treatment must be controlled to obtain the desired properties. At the present time the steel is used for detachable bit rods and a single air cool treatment is used.

Alloy Mn-Cr-Mo is the most recent alloy drill steel development. It is the result of an investigation by Crucible Steel Co. in 1951 to develop a drill steel that would meet various requirements defined by Ingersoll-Rand Co.

To avoid experimentation with heat treatment in the field, and due to lack of equipment at many properties, the steel was deliberately made relatively insensitive to temperature and quenching variations within a wide range. When cooled in either air, oil or water from temperature range of 1575 to 1800 deg F, the hardness developed will be within the desired range for shanks and threads of detachable steel, i.e., not less than 39 R_c and not more than 50 R_c. If quenched in water from the high side of the range, the steel will have a tendency to crack. This is a normal characteristic exhibited by most steels when intensively quenched from high temperatures.



ETCHED SECTIONS of carburized sectional rod elements show case hardened structure. Core is tougher and less brittle.



STEEL STRENGTH depends on composition and heat-treat. Residual (trapped) surface compression adds to rod strength.

3. Carburized Drill Rods Have Long Life

FLOYD R. ANDERSON

CARBURIZING promotes a case-core structure that adds life to drill steel. Carburizing is a process for absorbing carbon into the surface layer of steel by heating the steel in contact with a solid, liquid or gas which supplies nascent carbon. Gardner-Denver heats the steel in a carbonaceous atmosphere.

Depth of case is controlled by the time the steel is held at the carburizing temperature. Hardening of the case to high values and the core to lesser values is accomplished by quenching from the carburizing temperature, usually in oil. All surfaces, internal as well as external, are carburized and hardened to a controlled depth and hardness. Threaded couplings are similarly treated, except the outer surface which is left soft to permit gripping by a wrench.

A typical sectional drill rod assembly is shown in the photos. Photos also show etched cross-section in which the case-core structure is visible.

Tests show drilling life of carburized steel is three to ten times the life of plain carbon or alloy rods. High endurance strength is the reason for improved service. It accrues from the combination of high surface strength or hardness and a high degree of surface compression. Shot-peening of rods so treated further enhances compressive stresses on the outer surfaces. The graph gives the relative case hardness and endurance strengths of carburized, alloy and plain carbon rods.

For rods, alloy carburizing steel is the starting material which embodies a low carbon content for ensuring correct core hardness and sufficient alloy to promote full hardening of the carburized case on all surfaces. A typical analysis is A4320, (0.20% C, 1.75% Ni, 0.50% Cr, .25% Mo) although other alloy types may be used.

Couplings and bit adapters are made of more leanly alloyed carburizing steels such as: A8620 (Ni-Cr-Mo) or A94B17 (Ni-Cr-Mo-B), sometimes containing lead for improved machinability. Such fabrication shows increased life to about twice that obtainable from hardening alloy steels such as A4140.

The method of treatment used by Gardner-Denver in producing carburized rods is described in their recent U.S. Patent 2,804,412 and Foreign Patents.

It is obvious that treating rods up to 20 ft in length requires equipment and experience beyond the abilities of the average mine shop or drill steel conversion shop. Worn or broken carburized rods are not suitable for rework due to the high cost of such repair and uncertainty of results. Actually, the same may be said of re-working plain carbon or alloy rods, although such practice is prevalent. Often the cost of repair exceeds the value of additional service because existing fatigue cracks cause rapid failure upon re-use. If time and money is spent on improving drilling practices rather than throwing it away on scrap, real economy can be realized. Good cost and performance records will show the wisdom of scrapping worn or broken drill rods. Wear gages are recommended for accurately showing when worn equipment should be scrapped, because continuing such parts in service often accelerates damage to mating parts.

Carburized, shot-peened drilling rods have been offered by Gardner-Denver for the past two years, although many years of development work were required to bring such equipment to its present status. They are offered in sizes ranging from ⅞-in. hex up to 1⅞-in. hex. Long hole sectional rods give outstanding performance; the same is true of one-piece rods for detachable bits. Improved mechanical design—found to be of importance equal to or greater than metallurgical refinements—also contribute to this success.

Mining and construction operations throughout the world are using carburized drill rod equipment to great advantage both as to cost of rod per foot drilled and increased speed of drilling brought about by the more efficient transmission of drilling impact by hard steels.

Where operating conditions are kept in line with good practices, drilling costs are much lower with carburized rods. On the other hand, if operating practices are abusive or correct design factors have not been observed, such steel will show no advantage. Since drilling costs are being more closely scrutinized and drill steel represents a large percentage of such costs, the use of carburized rods is growing rapidly.

Mr. Anderson is assistant manager with Gardner-Denver Co. at Denver, Colo.

4. Spiral-Rolling Ups Strength Even More Than Shot-Peening or Induction Surface Hardening

T. W. WLODEK

SUBSTANTIAL INCREASES in endurance strength and fatigue limit of drill steel are produced by shot-peening, induction surface hardening and spiral-rolling. Of these, spiral-rolling (after all forging and heat treating has been done) is most effective.

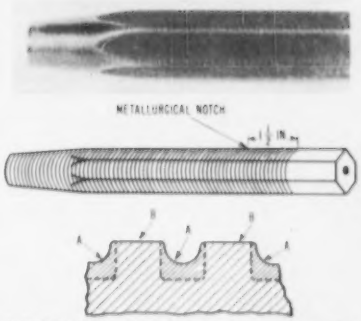
Spiral-rolling of drill steel impresses one or more spiral (helical) grooves into the surface of the rod and thereby develops a residual surface compression which increases durability. At the attachment end, the spiral grooves are impressed into the conical type attachment and into the surface of the adjacent few inches of drill steel which may contain the metallurgical notch. At the shank end, both the length exposed to premature failure and the length containing the metallurgical notch, when such is present, are spiral-rolled.

Dr. Wlodek is head of Fatigue of Metals Section, Physical Metallurgy Division, Department of Mines and Technical Surveys, Ottawa, Canada.

Typical example of S.R. (spiral-rolled) conical drill rod attachment and metallurgical notch is shown in the illustrations.

Full-scale field tests, together with laboratory simulated service tests, indicate that the drilling life of spiral-rolled attachments, metallurgical notches and drill steel, in general, is about three or more times longer than the drilling life of components of drill sets produced by standard methods. See tables below.

Spiral-rolling of drill steel is based on the principle of so-called differential plastic deformation. One illustration shows a S.R. surface covered by areas (A) with large plastic deformations in the valleys, and areas (B) with smaller or no plastic deformations at the peaks. This interlocking of areas with different amounts of plastic deformation is responsible for the locked-in residual compression



GROOVED ROLLS press pattern into surface and smooth rolls flatten peaks.

Drill Rod—Lab Tests

On Type I Machine (a) Water corrosion conditions with metallurgical notch. (b) Dry conditions with metallurgical notch. Other tests dry and no metallurgical notch present.

Bending moment, in.-lb	Max. stress, psi	Cycles to failure*		Endurance factor
		Untreated	Spiral-rolled	
	⅞-in. QO Ni-Cr-Mo "Chippewa"			
6,000	85,500	74,000	1,358,000	18.5(a)
6,000	85,500	121,000	1,109,000	9.0(a)
5,000	71,250	204,000	6,448,000	31.0+(b)
6,000	85,500	89,000	1,180,000	13.0(b)
	⅞-in. QO Plain Carbon SAE 1080			
5,000	61,500	90,000	1,055,000	11.5
	1-in. QO Cr-Ni-Mo steel			
7,000	57,500	350,000	6,000,000+	17+
8,000	65,800	282,000	6,000,000+	21+
9,000	74,000	80,000	6,000,000+	25+
	⅞-in. hex Ni-Cr-Mo "Nushank" steels A, B, C			
4,000	57,000	216,000	3,385,000	15.5
4,000	57,000	216,000	4,200,000	20
4,000	57,000	216,000	7,724,000+	36+
4,500	64,125	40,000	103,000	2.6
5,000	71,250	75,000	120,000	1.6
5,000	71,250	75,000	135,000	1.8
5,000	71,250	75,000	200,000 (100 min.)	2.7
	⅞-in. hex Cr-Mo steel "R"			
4,000	57,000	169,000	6,075,000+	36+
5,000	71,250	89,700	989,000	11
6,000	85,000	35,000	294,000	8
	⅞-in. hex Cr-Mo "Vibresist" type steel "S"			
5,000	71,250	82,000	229,000	2.8
5,000	71,250	82,000	295,000	3.6
5,000	71,250	82,000	366,000	4.5
5,000	71,250	82,000	286,000	3.5
	⅞-in. hex Cr-Mo "Vibresist" type steel "V"			
5,000	71,250	86,000	5,127,000+	60+
6,000	85,500	231,000	2,137,000	9.2

NOTE: *One minute of drilling time equals 2,000 cycles. Type I and II machine is modified Sonntag rotating beam fatigue unit. Type III is Baldwin-Sonntag vibrating fatigue unit.

Drill Rod—Lab Tests

On Type II machine. With threaded attachment

Bending moment, in.-lb	Cycles to failure*			Endurance factor
	Untreated	Shot-peened	Spiral-rolled	
	⅞-in. hex Cr-Mo steel "T"			c/a=4.7
3,000	485,000=a	1,391,000=b	2,293,000=c	b/a=2.9

Conical Attachments—Lab Tests

On Type III Machine. Water corrosion conditions on all. (a) Heat treated. Others no heat treat. (b) With shim, thickness 0.005 in. (c) With shim, thickness 0.018 in.

Load lb.		Cycles to failure*		Endurance factor
Static	Dynamic	Untreated	Spiral-Rolled	
12 deg taper Type "B" on ⅞-in QO "Chippewa" Ni-Cr-Mo (a)				
3,000	±900	335,000	1,732,000	5
3,000	±800	416,000	1,373,000	3.3
12 deg taper Type "A" on ⅞-in. hex "Nushank" Ni-Cr-Mo				
3,000	±800	334,000	1,440,000	4.2
12 deg taper Type "B" on ⅞-in. hex "Vibresist" Cr-Mo				
3,000	±800	452,000	1,329,000	3(b)
3,000	±800	125,000	641,000	5.2(c)
6 deg taper Type "C" on ⅞-in. hex "Nushank"				
3,000	±800	513,000	2,780,000	5.2
6 deg taper Type "C" on ⅞-in. hex "Vibresist"				
3,000	±800	445,000	4,319,000	9.4

Conical Attachments—Field Test

	Ft drilled per attachment		Increase per cent	Total ft drilled
	Standard	Spiral-Rolled		
Test I	103	348	238	1,392
Test II	32.9	139.8	324	2,820
Test III	235	532	126	—
Test IV	197	372	89	—
Test V	150	600	300	2 million
Test VI	25	230	820	Used old
Test VII	16	160	900	drill steel

stresses which increase the durability of the S.R. drill set.

In order to increase the magnitude of locked-in residual compression stresses, and thereby further increase the durability of the S.R. drill-set, the peaks of the impressed spirals are over-rolled with a smooth roller, causing them to be pressed in between the two neighboring grooves. The intensity of spiral-rolling of the drill steel is regulated by the pressure applied, the shape of the groove and the sharpness of the rollers.

The method of spiral-rolling of drill steel is fully described in Canadian Patent No. 528010.

Durable spiral-rolled type drill set passed the laboratory and experimental stage in 1955, and is now ready for use in mine drilling. Spiral-rolling of drill steel may be used effectively in all cases where a weak section exists in a drill set, or as a replacement of heat treatment. Also, it is possible that spiral-rolling treatment of plain carbon drill steel will increase its performance to such an extent that it could replace, if desired, the alloy steel presently employed.

Simple and inexpensive spiral-rolling machines employing springs or oil pressure have been developed to manufacture S.R. drill-sets. Hence, the spiral-rolling of drill sets can be carried out either at the mine or at the plant producing the drill steel, depending upon local conditions and requirements. At present, about 30 mines are licensed to use S.R. drill sets as their standard equipment and others are experimenting with them.

It is expected that the S.R. type drill set will contribute much to a further reduction of the ultimate over-all cost per foot of advance in mine drilling operations.

[**Ed.—Shot-peening** is a process in which tiny iron or steel spheres or cylinders are thrown against the surface of steel at a high velocity by air jet or high-speed wheel].

The beneficial effects of shot-peening can be explained as being a result of:

1. Locked-in high surface-compression stresses introduced in the surface layer by large plastic deformation through surface spreading effect of intensive shot-peening. These residual stresses are mainly responsible for improving the fatigue strength of rods.

2. Smoothing of the rough and irregular surface of "as-rolled" drill rod by the impact and cleaning action of shot striking the rod in large quantities and under high velocity. The direct effect is the reduction of the stress concentration at the roots of numerous notches at the surface.

3. Cold-working of thin surface layer which gives it higher mechanical properties, such as yield and ultimate tensile strength and, therefore, higher fatigue strength.

Surface-compression stresses (No. 1, above) should be regarded as most effective. They are built up by the elastic recovery of the plastically deformed thin outside layer. At present all types of drill rods are decarburized on the surface to a depth depending on the chemical composition of steel, the temperature and oxidation intensity of the furnace atmosphere, and the time exposed during the heating and rolling operations. Hence, the shot-peening treatment will affect primarily the rough as-rolled and decarburized surface.

The locked-in compression stress, when superimposed by working stress, gives a resultant surface stress during tension loading which is lower than the tension working stress by the magnitude of the residual stress locked-in during shot-peening. In compression loading, the compression working stresses are increased by the same amount.

The upper limit of the locked-in compression stresses introduced by shot-peening is limited by the yield strength of the outside decarburized surface. The maximum possible increase in fatigue limit which may be obtained by shot-peening would be determined by a comparison of the fatigue limit of an as-rolled drill rod with the fatigue limit of a smoothly machined drill rod after shot-peening.

[**Ed.—Induction surface hardening** is a process in which only the surface of steel is raised above transformation temperature within a few seconds by means of high frequency alternating eddy currents induced by a magnetic field, immediately after which the steel is quenched.]

The mechanism of the improvement of fatigue strength of drill steel by induction surface hardening, as seen in S-N diagrams, is somewhat different from that of shot-peening. In this type of surface treatment the following phenomena contribute to the improvement of the fatigue strength of the drill steel:

1. Residual thermal stresses built up during the quenching of the induction heated surface are developed in the surface layer or case about 20 to 50 thousandths of an inch deep. These stresses are introduced by the changes of volume taking place during the transformation of austenite into martensite. If these volume changes are greater than the average thermal contraction coefficient, this could account for substantial locked-in compression stresses.

2. A much higher hardness and, therefore, a higher fatigue limit is developed in the decarburized zone. However, the quenching of induction heated, rough, as-rolled surfaces might increase the number of surface cracks and also might increase previous irregularities and sharpness of the roots of notches in the outside surface of drill steel; all of which could have a detrimental effect on fatigue strength.

Taking into consideration the beneficial effect of shot-peening, it would be reasonable to expect that the induction surface hardening treatment followed by shot-peening could further improve the laboratory fatigue performance of drill steel. (See graphs. The S-N relations for this combined treatment are shown in curve EIS.) A small drop of fatigue limit as compared with induction hardening alone and shot-peening plus draw alone, shows that the expected beneficial effect of surface treatment had reached its optimum and that any additional effort to increase the effect of locked-in surface stresses is not effective, and might even be detrimental.

References

1. J. H. Bloemsma, R. Ramsay and O. Deane, "Some Experiments with Tungsten Carbide Tipped Drill Steel", *Journal of the Chemical Metallurgical and Mining Society of South Africa*, January 1947.
2. E. J. Wells, "Percussion Rock Drilling with Tungsten Carbide Tipped Bits", *Chemical Engineering and Mining Review (Australia)*, January 1949.
3. James E. Lewis, "Notes on the Engineering Design of Tungsten-Carbide Rock Bits", *Australasian Inst. Min. and Met.*, March 1950.
4. L. C. Bogan, "Notes on the Metallurgical Design of Tungsten-Carbide Rock Bits", *Australasian Inst. Min. and Met.*, March 1950.
5. Donald H. Bell and Paul E. Clarke, "Tungsten-Carbide Drilling Investigations at Morning Star (G. M. A.) Mines, N. L.", *Australasian Inst. Min. and Met.*, March 1950, Paper No. 19.
6. J. M. Antill and J. L. Rea, "Experiences in Rock Drilling with Tungsten Carbide Tipped Bits", *The Journal of the Institution of Engineers, Australia*, Vol. 23, No. 6, June 1951.
7. W. H. McCormick and R. W. Persons, "Trends in Hollow Drill Steel", *Mining Congress Journal*, September 1952.
8. E. Williams and C. E. Caldwell Wearne, "Mining Methods at Mount Morgan Limited", *Australasian Inst. Min. and Met.*, August 1952, Paper No. 26.
9. Floyd R. Anderson, "Mechanical Treatment of Drill Steel", *Mining Congress Journal*, November 1954.
10. R. J. Marcotte, "Control—The Payoff", *Mining Congress Journal*, November 1954.
11. T. E. Norman, "Materials, Treatment and Design for Drill Rods", *Mining Congress Journal*, November 1954.
12. Peter Payson, "Heat Treatment", *Mining Congress Journal*, November 1954.
13. William F. Towne, "Development of Materials for Hollow Drill Steel", *Mining Congress Journal*, November 1954.
14. B. F. Shepherd, "The Problem—What—Why—How", *Mining Congress Journal*, November 1954.
15. B. M. Hamilton, "Modern Trends in Hollow Drill Steel", C. I. M. *Transactions*, Vol. LVII, 1954, pp. 486-493.
16. Max Gelwix and John W. Goth, "Testing Drill Steel At Climax", *Mining Congress Journal*, October 1955.
17. W. R. Cheetham and E. W. Inett, "Factors Affecting the Performance of Percussive Drills", *Transactions—Inst. of Mining and Metallurgy*, Vol. LXIII, 1953-54.
18. E. W. Inett, "High Speed Drifting in the Ruhr Coal Field with Special Reference to Drilling Techniques", *Transactions—The Institution of Mining Engineers*, Vol. 114, 1954-1955.
19. T. W. Wlodek, "A Method of Fatigue Testing Mining Drill Rods", C. I. M. *Transactions*, Vol. LIV, 1951, pp. 111-120.
20. T. W. Wlodek, "The Effect of Water Corrosion and Shot Peening on Fatigue Strength of Mining Drill Rods", C. I. M. *Transactions*, Vol. LV, 1952, pp. 292-300.

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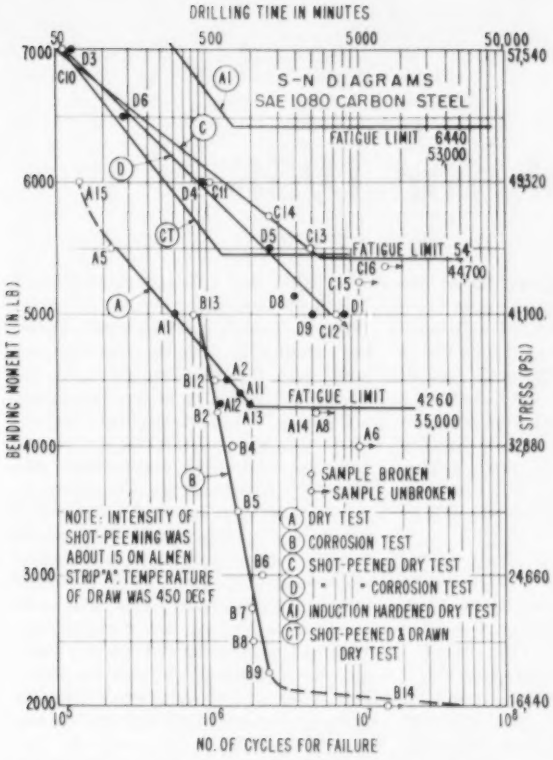
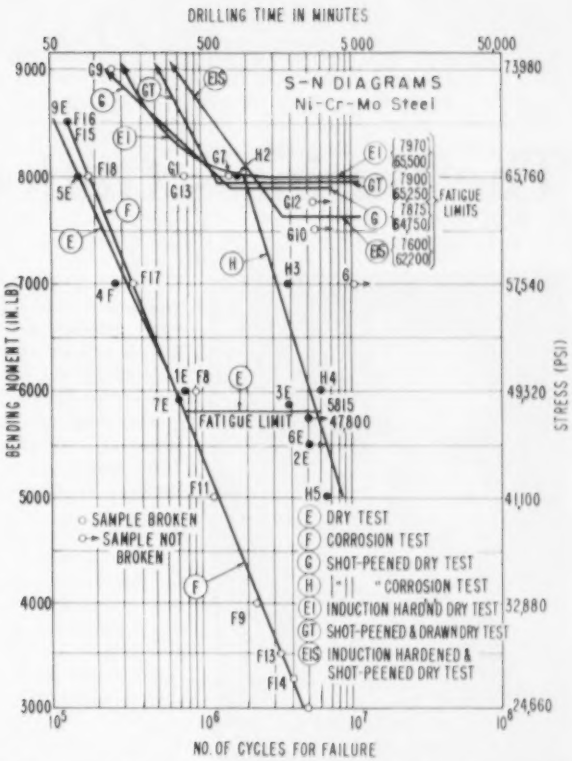




Fatigue Tests of Drill Steel Are Informative

To study the effect of shot-peening, shot-peening plus low draw, induction surface hardening, induction hardening plus shot-peening, and spiral-rolling, on the endurance strength and fatigue limit, one-inch quarter-octagon drill rods made from plain carbon (SAE 1080) alloy (Cr-Ni-Mo) and steels were tested on a modified Sonntag rotating beam fatigue machine, Type I described in reference 19. Results are shown above. The chemical compositions and the mechanical properties of these steels are given in reference 20, tables I and II. [Ed.—Alloy is .47% C, .66% Mn, .26% Si, 2.93% Ni, .37% Cr, .21% Mo]

This method, introduced in 1950, is simple, very low cost, reproducible and renders numerical results, i.e., stress in psi and life in number of cycles to failure. While final acceptance of a chosen type of surface treatment should be done by actual operational drilling tests, simulated service test results such as these S-N relations can be used for preliminary evaluation.

As compared to the fatigue limit of the SAE 1080 drill steel in the as-rolled condition under dry rotating bending conditions, the fatigue limit of the same steel after shot-peening increased 28%; after shot-peening and draw, it increased 28.5%; and after induction surface hardening, 51%. Although not shown on graph, spiral-rolling gave an increase of about 75%.

Crossing of the S-N curves A (dry conditions) and B (water corrosion conditions) shows that water starts to be detrimental for a new drill steel after a million cycles (about 14 hours). Up to that time, i.e., at high stress levels, some beneficial effect of water cooling could be reported. The steeper slope of the curve B shows that the life of drill steel under water-corrosion conditions is much shorter than under dry conditions.

Shot-peened surfaces, besides increasing the endurance strength and fatigue limit of steel SAE 1080 (compare lines A and C), reduce considerably the effect of the increase of slope of S-N curve due to water corrosion (compare line D to line B); the same could be expected after induction hardening. The life of D steel is greatly increased as compared to B steel.

The effects of the various surface treatments on Ni-Cr-Mo steel are shown on the other S-N graph. An immediate conclusion in comparing the two graphs is that the as-rolled fatigue limit under dry rotating-bending conditions for this alloy (line E) is 36.65% higher than for plain carbon steel (line A).

Increases in fatigue limit of the alloy, when given different surface treatments as against the as-rolled alloy, are: shot-peening 35.5%; shot-peening plus tempering (drawing) 37%; induction surface hardening 37%; and induction surface hardening plus shot-peening 30%. Although not shown, spiral-rolling gave over 55% increase.

S-N relations obtained from as-rolled alloy steels E (dry) and F (wet) show again that the effect of water corrosion in the damaging range of stresses, i.e., above the fatigue limit, has a tendency to increase the life. Below the characteristic intersection, curve F is fairly close to a straight continuation of the curve E above the fatigue limit.

The beneficial effect of the shot-peening of Ni-Cr-Mo drill steel, as shown by E (as-rolled, dry) and G (shot-peened, dry) curves is characterized by a large increase of fatigue limit and by a large increase of the life of drill steel for stresses above the fatigue limit of G steel. This increase diminishes in the higher stress range because of a lower slope of curve G as compared with E. The S-N curves F (as-rolled, wet) and H (shot-peened, wet) are almost parallel on a semi-logarithmic scale, but for the same stress the life of H is about 7 to 8 times as long. The increase of the slope of the H curve in relation to the G curve illustrates the possibility of a beneficial effect of water cooling in the higher range of stresses, i.e., above the fatigue limit of G steel.

Benefits of the other treatments are apparent from the graphs, too.

References *(Continued)*

21. T. W. Wlodek, "Mechanical-Metallurgical Problems Associated with Mine Drilling Operations", C. I. M. *Transactions*, Vol. LV, 1952, pp. 377-383.

22. T. W. Wlodek, "Mechanical-Metallurgical Improvements in Drill Steel", C. I. M. *Transactions*, Vol. LVIII, 1955, pp. 52-58.

23. T. W. Wlodek, "The Application of Spiral-Rolled Drill Steel in Canada", C. I. M. *Transactions*, Vol. 1957, pp. 124-127.

24. T. W. Wlodek, "Spiral and Pattern Rolling of Drill Steel", Canadian Patent No. 528,010, July 17, 1956.

25. D. S. Kemsley, "The Failure of Steel Rock Drill Rods by Fatigue", Proceedings, *Australasian Inst. Min. and Met.*, No. 175, September 1955, pp. 1-19.

26. D. S. Kemsley, "Mechanical Factors in the Fatigue of Steel Rock Drill Rods", *Proceedings, Australasian Inst. Min. and Met.*, No. 175, September 1955, pp. 21-34.

The Business Outlook for 1958

DEXTER M. KEEZER

IN BUSINESS, 1958 shapes up as another very good year. There is a chance of its winding up even better than that. This year the gross national product—roughly translated as the total volume of business—will run about $435-billion. For the year 1958, it will probably run about $445-billion. This is not a rip-roaring boom. It means that, instead of being wonderful, the year as a whole will just be very good. And it could be moving up fast toward the end of the year.

The second key characteristic of the year 1958 is that it will certainly be one of the most competitive years since the end of World War II.

A third characteristic is that next year more money will be spent on research and development of new products than in any year in our history.

Fourth, business expenditures for new plant and equipment, which provide a large part of our economic lifeblood, will be down a little from this year's all time high.

A Let-Up in Investment

The McGraw-Hill Economics Department is completing its annual fall check-up on plans for new plants and equipment in 1958. On the basis of early returns, it's clear now that research and development expenditures will hit an all-time high next year. It also seems reasonably clear that, as a whole, business investment in new plants and equipment will be down a few percentage points next year—perhaps as much as 5%. Manufacturing, so far as we can tell, will be down more than that.

If this proves to be the case, it will be the first let-up in investment in new producing facilities since 1954. Since then, this investment has been going up at a fabulous rate. In 1955 it hit a new all-time high. In 1956 it jumped again by the tremendous figure of 22%. This year it now looks as though business investment, after last year's surge, will be up, but it will probably be about 7%.

The fact that next year business investment will be down slightly is going to come as a rude and uncomfortable shock to many people who have been accustomed to its going up all the time. Actually, business investment will be going ahead at what only a few years ago would have seemed an unbelievably high rate. The prospect is that next year we will put in place, in physical volume, more than 12% more than we did in 1955. One of our problems is going to be to help some people with short memories to get perspective of what's happening.

Capacity and Competition

The principal reason why investment in new manufacturing facilities will be down considerably next year is that a lot of industries have built up more capacity than they now need. Since 1950 our McGraw-Hill index of manufacturing capacity indicates that this capacity has been increased by about 50%. Industrial production is running only about 38% higher.

The capacity situation varies from industry to industry and from one part of an industry to another part. I was told recently that in the chemical industry they are still short of capacity to make titanium oxide, but another source has since informed me that it's becoming abundant, too. The other day I heard what seemed to me an absolutely ghastly figure of speech. A man said to me: "We've got ammonia running out of our ears." As far as you can tell, the automobile industry is now operating at 70% to 75% of its capacity. In contrast, the heavy electrical machinery industry, with utility expenditures still going up, is running at 90% or over.

In general, from our McGraw-Hill surveys, we know that as a whole manufacturing industries would like to operate at about 90% of their capacity at year-end. Our best calculation is that at the present time manufacturing industries on the average are operating at about 82%. This build-up of capacity obviously means some let-up in the installation of new capacity.

The build-up also has another very important meaning. It will be a key contributor to making 1958 the most rugged year competitively we have had in industry since World War II. Manufacturing capacity for almost everything is in ample supply. This means the most rugged competition for sales. At the same time, wage rates are going to keep right on going up; and our big unions have the power to see to that. This means heavy upward pressure on costs. Business management is going to be caught in the middle between pressure on prices from severe sales competition —that is, downward pressure—and upward pressure on cost from wage increases.

Research and Long-Range Planning

The increase in competitive pressure is going to be felt in another way —a record-breaking outlay for research and development. Our survey of business plans shows that expenditures for research and development this year will be $7.3-billion. I am very certain that this constitutes by far the most dramatic fact about American business today. But it is clear that the expenditure in 1958 will be even higher.

A large part of this research and development is directed to the perfection of products which won't be ready for market for several years.

Mr. Keezer is vice president and director of economics of the McGraw-Hill Publishing Co., Inc.

My associates in the McGraw-Hill Department of Economics, Robert Ulin and Russell Eggers, have prepared a report revealing that there is a seven-year lag between starting research on a product and getting the product set to market in a big way. I understand that the Union Carbide formulation of this proposition is that it takes seven years from test tube to tank car. But the record-breaking expenditures for research and development are clearly paving the way for another tremendous surge in investment in new plant and equipment down the road a few years.

There has also been a great increase in long-range planning of business investment over the past ten years. This is the tenth year of our McGraw-Hill annual surveys. When we started, not over a handful of American corporations—and I use that term literally—could give us their investment plans beyond the current year in which we asked the question. This year 90% of the cooperating companies—and it's a number several times as large as that with which we started—could give us estimates of their investment running at least three years ahead.

Important as it is, business investment does not go forward in a vacuum. There is a process of interaction with other parts of the economy. So let's take a quick look at other major parts of the economy to see what the prospects are there.

Government Expenditures

There has been a lot of talk recently about drastic cuts in expenditures for national defense. It is stated that the goal set is a cut of $4-billion, from $42-billion to $38-billion by mid-1958. This doesn't mean that the Russians' chances of exterminating you and me will be improved. I certainly hope that we attain the goal and make the cuts.

I don't go along at all with the notion that we must have ever higher defense expenditures to sustain prosperity. If the cuts are made, some individuals, companies and communities will be hit temporarily—some hard. But it will also mean that we have resources to make a lot of badly needed civilian improvements. And I've faith that we've got enough sense to make the shift in an orderly and constructive way. I feel strongly that we give the Communists a lot of aid and comfort they don't deserve when we argue that a cut in defense expenditures will be bad for business.

Whether the cuts being talked about will actually be made is something else again. Recently we have met with some of the best people in the Government to discuss the prospects. One of them made the interesting remark that the Government hadn't yet figured out where it was in defense expenditures three years ago. Consequently, it is a little bit difficult to tell where it is now and where it is going to be a year from now.

In the discussion, one paradoxical point was developed: When Government cuts defense expenditures, it may actually increase them in considerable volume for a time. The example used was this: A cut in the armed forces of a hundred thousand, which has been announced along with others, means very large outlays for termination pay, accumulated leave, etc. Cancelling contracts likewise involves very heavy windup expenses. So, over the period when these cuts are being made, it may well develop that in some cases the cost of doing the job will temporarily increase Government expenditures.

But about these prospective cuts in Government expenditures, there was one phase about which there was complete agreement. It was that any reduction in national defense expenditures that is attainable will be fully offset by the increase in state and local expenditures—so that as a whole in 1958 a decline in Government expenditures will not be exercising a heavy drag on business. These expenditures—by Federal, state and local governments—are now running at the staggering figure of about $87-billion per year. They won't be running any less in 1958.

A Lift from Consumers

Consumer expenditures account for about two-thirds of GNP—by far the largest chunk of business. In this crucial area, things have been picking up lately in a very handsome way. For the year 1957 as a whole, consumer expenditures will be up about 5% above last year. For July and August, the most recent months for which figures are available, consumer expenditures have been running at a rate of more than 7% above the same months in 1956. If this trend were to continue into 1958, the increase in consumer expenditures could easily wipe out all prospective minuses elsewhere, and a lot more.

A remarkable thing about the pickup in consumer expenditures in recent months is that it has been made without benefit of any pickup in sales of consumer durable goods, such as automobiles and appliances. Sales there continue to drag. If sales of appliances and automobiles were to get going well this fall, we might find ourselves talking about a consumer goods boom by next Easter. I am, personally, inclined to doubt that they will get going in a very flamboyant way this fall. There seems to be some doubt that the newer models of cars and appliances are likely to whip consumers into a frenzy to get at them.

But even if I am right in my uneasy suspicion that sales of automobiles and appliances will not get to surging this fall, it won't be because consumers haven't got the money to buy them. They very clearly have the money. They haven't been seized by the desire. That's another way to say that the selling—and I'm including everything from designing to doorbell-pushing—hasn't been anywhere near good enough. In any event, the prospect is that consumer buying will carry on into 1958 at a high level.

Slowdown in Growth

I don't want to leave the impression that I find everything on the economic scene idyllic. I cite here a major cause for concern: Our economy hasn't been growing anywhere near as fast in real terms—that is, physical terms—in the last couple of years as it did before. Since the end of 1955 our economy has been growing at an average rate of about 1.6% a year. Roughly, over the decade before that, the rate of growth was 4.2% a year. Consequently, for the last couple of years our rate of growth has been slightly less than half of that in the years previous.

We are obviously heading into a great debate on this subject. Why is this true? One side says that the Federal Reserve is always keeping the lid on growth by following a tight-money policy. Federal Reserve authorities and their partisans respond that you must have tight money to stop inflation and get growth, because inflation kills growth.

You'll excuse me, but I won't settle this particular controversy here. Also, I don't propose to tell you whether we are going to have a big auto strike in 1958, as many anticipate. I don't propose to tell you whether we are going to have a big tax cut. The reasons are very simple—I don't know.

But I am confident that in 1958 we have the prospect of another year of general prosperity. I am confident, also that business next year will be carried out under competitive circumstances which, for the first time in many years, will provide a real test for business management.

BOLIVIA's largest tin concentrator, located at Catavi, is operated by Corporación Minera de Bolivia through Empresa Minera de Catavi for the Bolivian government, since the Patino enterprise was nationalized in 1952. Ore assays 0.8% Sn.

How Empresa Minera de Catavi

OSCAR DAVILA-MICHEL

CORPORACION MINERA DE BOLIVIA'S Empresa Minera de Catavi, Catavi, Bolivia produces about 8400 tons of fine tin a year from low-grade tin ores running but 0.9% Sn.

The system of concentration of the Empresa Minera de Catavi is divided among the following plants:

Sink-float plant; the Victoria mill; the Kraut jig plant; and the flotation plant.

Ores which consist principally of the tin mineral cassiterite with the gangue of rhyolite, slates and siliceous metamorphic rocks are mined in dimensions less than 10 in. with assay values varying between 0.80% to 0.90% Sn. This ore is treated in the sink-float plant, a short distance from the mine.

Ore is broken in McCully and Symons crushers to pass 1¼ in. The minus 1¼ in. material is thoroughly washed and classified in Allis-Chalmers Low Head vibratory screens. From that operation result two fractions, one of minus 1¼ in. plus 5/16 in., the other minus 5/16 in.

First fraction is treated in 10 ft dia cones of the HMS system in which ferrosillcon is used as heavy media. Sink is washed and screened in Allis-Chalmers Low Head vibratory screens to recover the ferrosilicon and is then shipped in railroad cars to the Victoria Mill in Catavi.

Float is treated in a similar manner for the recovery of ferrosilicon and is disposed of in storage dumps.

Minus 5/16 in. material is passed through mechanical classifiers, hydroclassifiers and finally through sedimentation tanks. Resulting sands are shipped jointly with the sink product to Catavi. Slimes, which do not settle, are brought to Catavi in a ditch and treated separately in an experimental slime treatment plant.

The sink and the fine sands form the feed for the Victoria Mill in Catavi and also for the new jig plant. Results of the sink-float plant for the year 1956 are shown in the following:

Product	% Weight	% Sn	% Distribution
Heads	100.00	0.89	100.00
Sink	19.00	1.42	81.00
Fines	31.00		
Slimes	4.00	0.70	3.20
Float	46.00	0.30	15.80

Located at Siglo XX, Potosi, the sink-float plant has a capacity of 5000 tpd, treating ore containing cassiterite, stannite, pyrite, antiomonite, bismuthite and wolframite. Heavy media is ferrosilicon (15% Si, 85% Fe) at an average density of 2.7. Concentration ratio is 2:1. Ferrosilicon consumption is 0.34 lb per tone ore. Fifteen tons of ore are treated per man shift.

Treatment in the Victoria Mill

Preconcentrates of the sink-float plant are reduced to minus ⅜ in. in rolls in closed circuit with Allis-Chalmers vibratory screens. Crushed material passes to the Victoria mill or else may be switched over to the Kraut jig plant. In the Victoria mill the material is classified by means of vibratory screens into three sizes: minus 6mm plus 3mm; minus 3mm plus 1mm; and minus 1mm.

The two coarser sizes are treated in Harz jigs, while the finer size is treated on tables. Jig tailings and table middlings are reground in rod mills and treated together with the minus 1mm material on tables.

Before treating this material it is deslimed in Dorr bowl classifiers. Sands are classified in Dorrco sizers and treated on the tables.

Slimes pass to settling tanks and Fahrenwald cones from which the coarser fraction is taken to tables for concentration.

Middlings from the last stage of table concentration are retreated on Buckman tilting tables, the concentrates of which are again treated on tables, and concentrates of the latter

Sr. Davila-Michel is mill superintendent, Empresa Minera de Catavi, Catavi, Bolivia.

VICTORIA MILL treats preconcentrates from the sink-float plant in jigs and tables. To recover more tin, a Kraut jig plant has also been installed. A flotation plant and a pilot recovery plant have been added. Mill feed assays about 1.42% tin.

Concentrates Tin Ores

join the feed to the flotation plant.

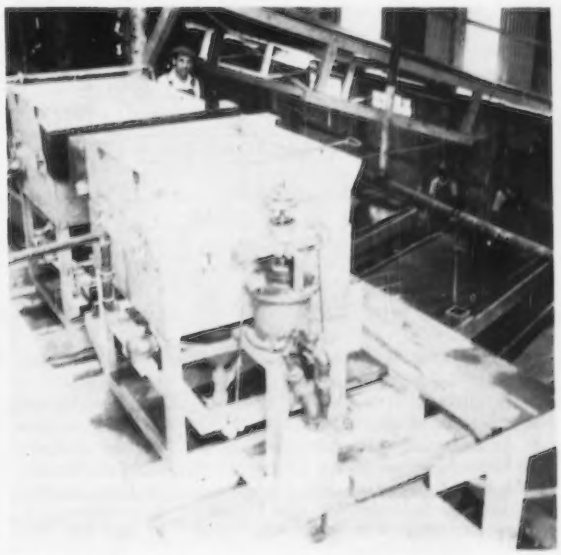
Slime tailings go to Dorr thickeners to recover the water and the underflow is pumped to a lake for settling the slimes, clear water running back by gravity to the mill to be used in its operation.

Victoria mill is located at Catavi, Potosi, situated about 4km from the sink-float plant. Mill feed in 1956 had the following typical assay: 1.42% Sn, 0.03% Bi, 4.35% Fe, 0.02% Cu, 0.02% Pb, 0.17% Zn, 2.07% S, 0.11% As, 0.06% WO_3, 13.54% Al_2O_3 69.55% SiO_2, 0.41% TiO_2 and 0.09% P.

Mill capacity is 2200 tpd with a 53:1 concentration ratio. Labor force includes three shift bosses, three cancheros, 315 operators; and in the flotation plant 50 men, and another 50 men are employed in bagging concentrate.

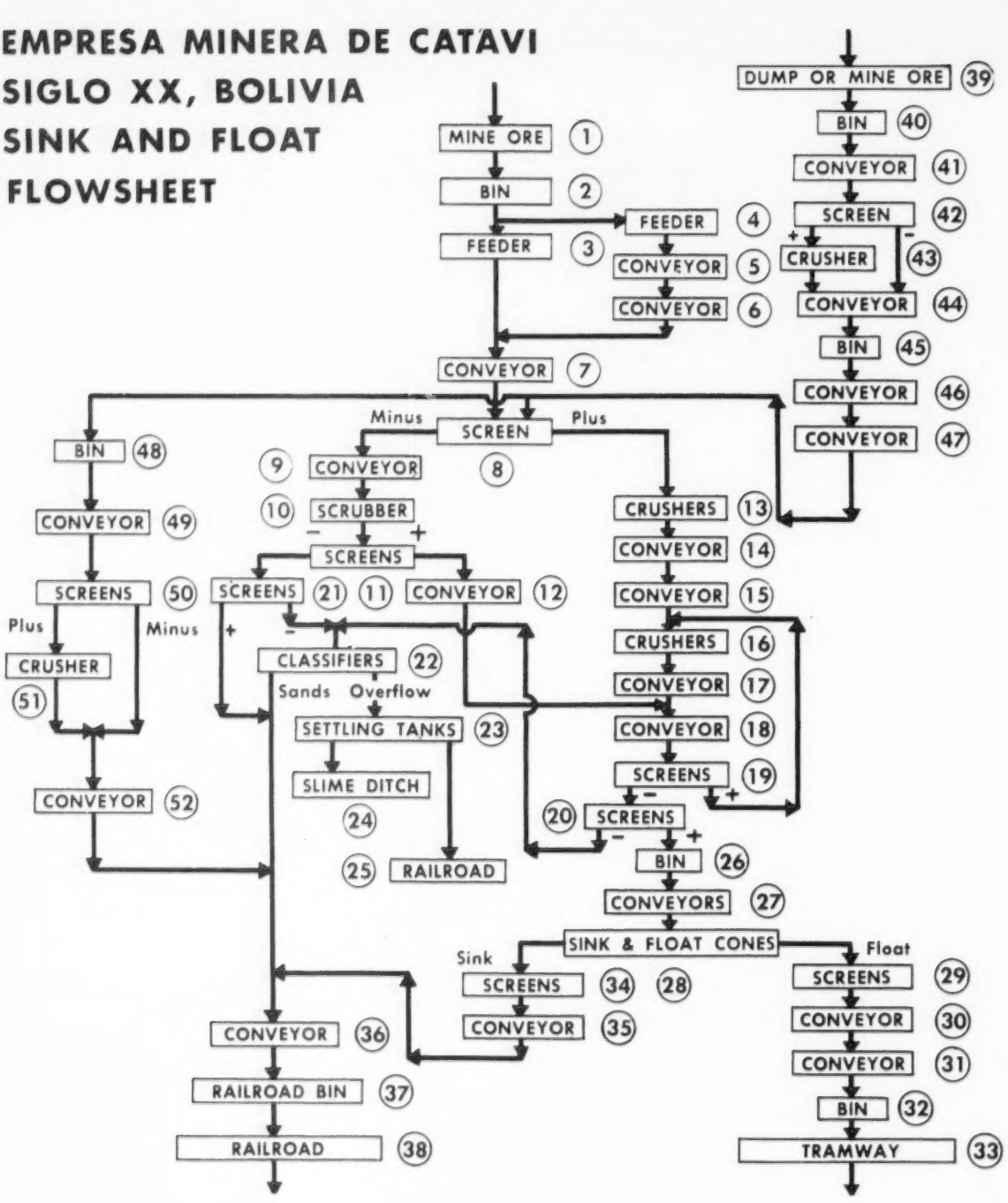
Finished concentrates assay as fol-

KRAUT PLANT uses a battery of 16 Panam-K jigs to produce a 25% Sn concentrate. Jig plant raised mill capacity 50%.



PILOT PLANT for treating slimes consists of Panam-K jigs, cyclones and tables. Plant produced 146 tons fine tin 1956.

EMPRESA MINERA DE CATAVI SIGLO XX, BOLIVIA SINK AND FLOAT FLOWSHEET



LEGEND

1. Minus 10-in. mine ore, bearing 0.8 to 0.9% Sn, is delivered at the rate of 4- to 5000 tpd
2. Two 650-ton mine ore bins
3. Amsco 30-in. pan feeder
4. Amsco 30-in. pan feeder
5, 6 and 7. Conveyor belts, 30-in.
8. One Style B, single-deck, Allis-Chalmers 5x12-ft screen with 3x3-in. openings
9. Belt conveyor, 30-in.
10. Revolving scrubber, 5x10-ft
11. Two Allis-Chalmers Low-Head screens, 5x12-ft, with ⅜-in. holes in punched plate
12. Belt conveyor, 24-in.
13. McCully 13-in. gyratory crusher
14. Belt conveyor, 24-in.
15. Belt conveyor, 24-in.
16. Two Symons 5½-ft standard cone crushers
17 and 18. Three belt conveyors, 24 and 30-in.
19. Two 4x8-ft Allis-Chalmers Low-Head screens with 1¼x6-in. slotted openings
20. Three Allis-Chalmers 5x16-ft Low-Head screens with 5/16-in. holes in punched plate
21. Two Allis-Chalmers 4x10-ft Low-Head screens with 1 or 2mm Ton-Cap screen
22. Classifier circuit: one 10-ft Esperanza-type drag, one 9x28½-ft Dorr Duplex rake, two 6x18¼-ft Dorr Duplex rakes, one 20-ft and one 30-ft dia Denver Hydro-classifiers
23. Four settling tanks
24. Slimes, running 0.6 to 0.8% Sn, are

sent to Catavi pilot plant
25. Settled slimes, running 0.8 to 1% Sn, are sent by railroad car to Victoria Mill
26. Surge bin—300-ton
27. Two 40-in. belt conveyors
28. Two 10-ft dia Sink-float cones, separating with Ferrosilicon at 2.7 to 2.75 sp gr. Ferrosilicon cleaning circuit not shown
29. Four float screens with 3/16th in. open punched plates, 4x14-ft
30 and 31. Belt conveyors, 24-in.
32. Bin—400-ton
33. Two tramways to dispose of rejected float
34. Two Allis-Chalmers 4x14-ft Low-Head screen with 3/16th in. open punched plate
35 and 36. Belt conveyor, 24-in.
37. Bin—2200-ton
38. Preconcentrates are shipped four km to Catavi in trains drawn by 285hp diesels
39. Old, hand-picked dump ore, containing 0.5 to 0.6% Sn, is sent to this circuit when available; also some mine ore
40. Bin—180-ton
41. Conveyor
42. Style B, single deck Allis-Chalmers 5x12-ft Low-Head screen with 3x3-in. openings
43. Two McCully 13-in. gyratory crushers
44. Conveyor, 30-in.
45. Bin—4000-ton
46 and 47. Conveyor, 30-in.
48. Bin—1200-ton
49. Conveyor, 24-in.
50. Allis-Chalmers 4x14-ft Low-Head screen with 1x12-in. slotted openings
51. Two Traylor Bulldog 6-in. crushers
52. Belt conveyor, 24-in.

lows: 55.17% Sn, 0.05% Bi, 5.76% Fe, 0.04% Cu, 0.23% Zn, 0.80% S, 0.19% As, 0.02% Sb, 0.35% WO_3, 5.29% Al_2O_3, 10.35% SiO_2, 1.32% TiO_2 and 0.12% P.

These concentrates are shipped to the smelter of the William Harvey Co. Ltd. in England for final processing.

Treatment in the Panam-Kraut Plant

For the reason that the assay values of the mine ore were progressively lowering, it became imperative to increase mine tonnage to compensate for the alarming reduction in the production of fine tin. It was therefore decided to increase the capacity of the Victoria mill by the addition of a jig plant.

With that object in view it was possible to make use of many installations of the Victoria mill and increase its total capacity by fully 50% with a relatively small capital investment.

Feed to the jig plant is either preconcentrates from the sink and float plant or else old sand tailings of which there are available large tonnages. This material is brought to bins from which it is fed to two 6x6 ft Marcy ball mills.

Discharge from these passes over two Allis-Chalmers vibratory screens provided with 1 mm openings. Oversize passes to two Allis-Chalmers 5x10 ft rod mills for regrinding, while undersize is fed to eight 42x42 in. Panam-K jigs.

Hutch product from these jigs goes to two cleaner jigs and the concentrates from the latter pass over two tables, yielding a concentrate assaying about 25% Sn and which is sent to the flotation plant.

Jig tailings and table tailings pass through two Dorr rake classifiers. Sand discharge from the Dorr classifiers is fed back to the rod mills, while the Dorr overflow joins the rod mill discharge to a 6 in. Wilfley pump which feeds the pulp to a row of 16 jigs.

Jig tailings are pumped to a set of four 20-in. cyclones. Spigot discharge of the cyclones is retreated in the Kraut plant, and the overflow is pumped to the lake for settling and recovery of water.

Jig preconcentrates are pumped to the concentration tables of the Victoria mill for final treatment.

Jig Plant Offers Many Advantages

From the foregoing description of the jig plant, it is readily seen that its operation is very simple and interesting, for the following reasons—

Capacity of the mill was largely increased with a relatively small investment of capital;

Concentration with jigs is effected on minus 1 mm material with satisfactory metallurgical results;

Additional tonnage of over 1000 tpd can be handled with relatively few additional men, 36 operators and 4 mechanics; and

Jigs work with unclassified feed which simplifies the flowsheet.

Treatment Plant

Plant has been in operation since November 1954. In 1955 it produced 144.67 tons of fine tin, and in 1956 production was 146.41 tons of fine tin from slimes—a high portion of which otherwise would have been practically a total loss. The plant now has been incorporated in the normal flowsheet of the Victoria mill.

Feed to the plant consists of primary and secondary slimes produced in the preparation of the mine ore for treatment in the sink-float plant. The material is very fine, a large portion in minus 4 micron sizes. Slimes pass first through two Dutch cyclones and then through Panam-K jigs followed by tables.

Through the experience obtained in this plant, a slime concentrator has been constructed that has been giving satisfactory results for the concentration of cassiterite slimes and some other slime materials of high specific gravity minerals.

Experimental Slime Plant

The slime concentrator, shown on p 108, consists of a square compartment (H) which, in its lower part, terminates in a conical frustrum, to which is attached a flexible rubber diaphragm (M), which carries the conical hutch (S), division plates (B), in its upper part supporting frame (N) and means for admission of hutch water (X) and (C). On the supporting frame (N) rest a series of long triangular bars (U), leaving a 1/4 in. open slot between them.

In the grooves between the triangular bars (U) is placed a single row of rubber balls 5/16 in. dia. or balls of any other material of low specific gravity, preferably about 1.1.

Feed to the concentrator enters preferably at the openings (P) beneath the supporting frame (N), but may in certain conditions enter on top at feed entrance (G). The concentrator is actuated through the motion of the conical vessel (S) which connects by shaft and bearings to lever (O), which, in turn, connects by cable to the Kraut fluid motor and counter lever (Q) with balancing counter weight (R).

Fluid motor provides the power for the operation of the concentrator.

This fluid motor, preferably activated with low pressure air (about 15 psi), is particularly adapted to the operation of this machine. The motor permits easy and rapid adjustments required in the operation of the concentrator. The adjustments are the following:

Length of stroke—variable from ½ to 4 in. by screwing top handle up or down;

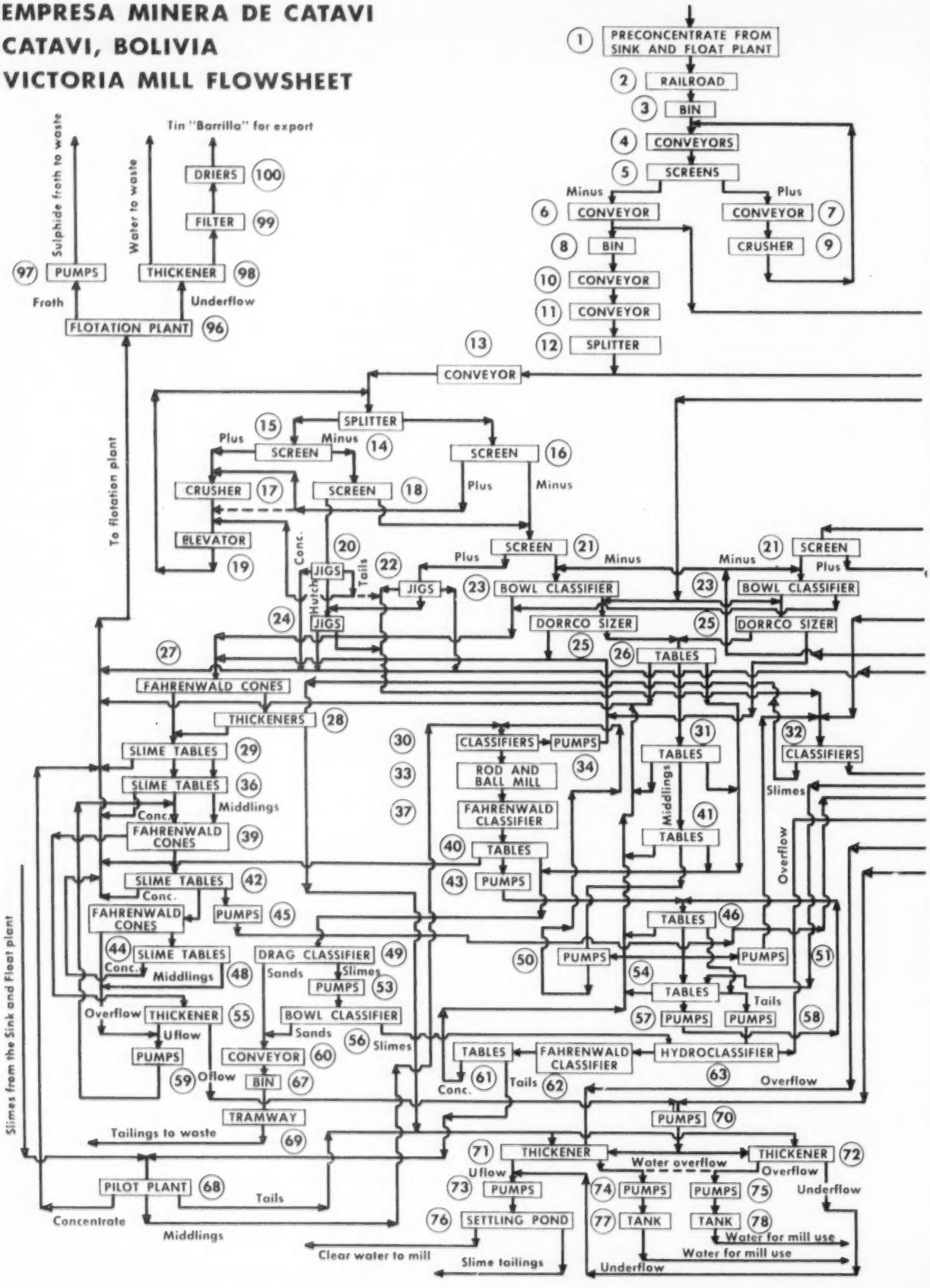
Speed—by admitting more or less air by air inlet valve;

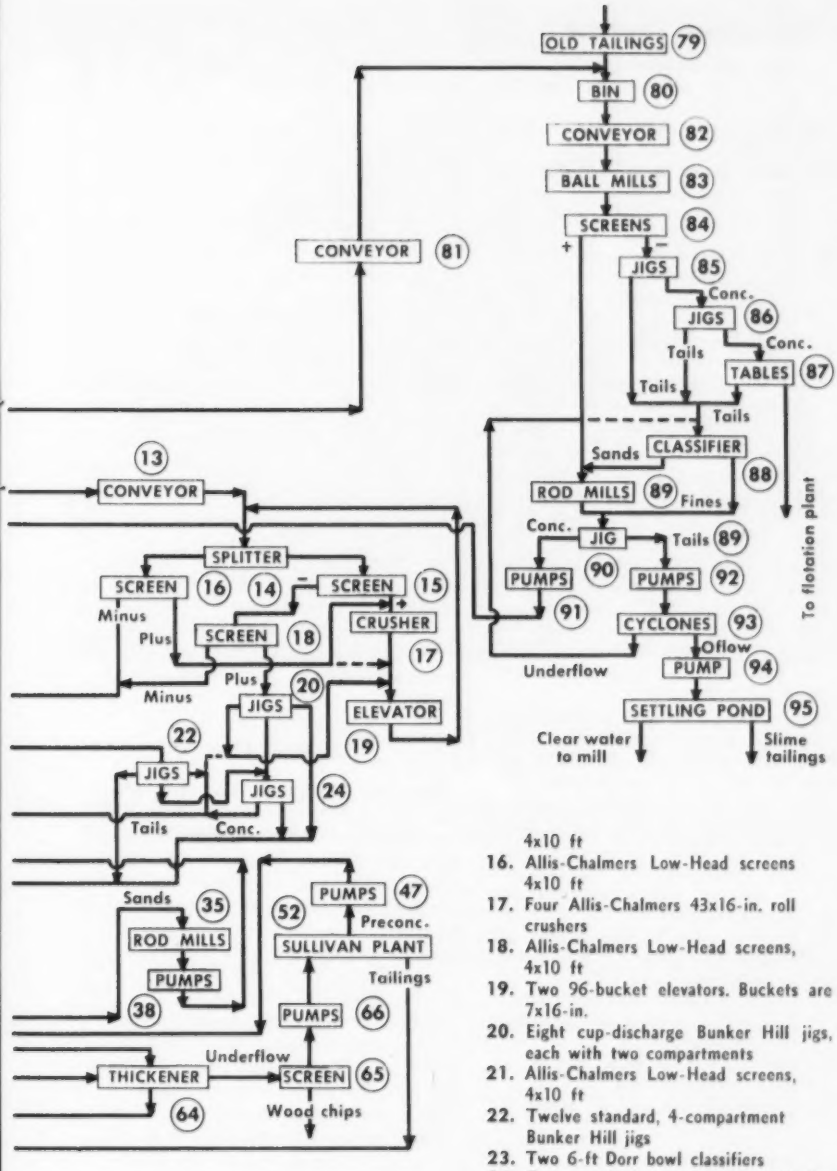
Differential—regulated by means of the air outlet valve which on closing holds back the air and slows down the down stroke to any desired speed.

With the motor it is possible to obtain as many as 400 strokes per minute with a short length of stroke.

In operation, the slime pulp enters the concentrator through openings (P). The fluid motor imparts to the hutch of the machine a very slow uniform upward motion which is followed by a sudden very rapid downward motion, the relation being about four seconds for the upward stroke to ½ second for the down stroke.

EMPRESA MINERA DE CATAVI
CATAVI, BOLIVIA
VICTORIA MILL FLOWSHEET





LEGEND

1. Two preconcentrates come from the sink-float plant. They assay 1.42% Sn and 2.7% Sn
2. Preconcentrates come to Catavi by railroad in 300 ton trips drawn by one of two 285hp diesel locomotives
3. Bin—2000-ton
4. Two 30-in. conveyor belts
5. Four Allis-Chalmers Low-Head screens, each 4x10 ft
6. One 24-in. conveyor belt
7. One 24-in. conveyor belt
8. Bin—2200-ton
9. Two Traylor 57x20-in. roll crushers
10. Two 20-in. conveyor belts
11. One 24-in. belt conveyor
12. Feed splitter
13. Two 20-in. belt conveyors
14. Two feed splitters
15. Allis-Chalmers Low-Head screens, 4x10 ft
16. Allis-Chalmers Low-Head screens 4x10 ft
17. Four Allis-Chalmers 43x16-in. roll crushers
18. Allis-Chalmers Low-Head screens, 4x10 ft
19. Two 96-bucket elevators. Buckets are 7x16-in.
20. Eight cup-discharge Bunker Hill jigs, each with two compartments
21. Allis-Chalmers Low-Head screens, 4x10 ft
22. Twelve standard, 4-compartment Bunker Hill jigs
23. Two 6-ft Dorr bowl classifiers
24. Four standard, 3-compartment Bunker Hill jigs
25. Two 6-pocket Dorrco Type EX-6 Sizers
26. Eight Deister Overstrom No. 6 diagonal tables and 20 Plat-O-Deisters
27. Sixteen Fahrenwald 10-ft cones
28. Three 30-ft and four 20-ft dia Dorr thickeners
29. Twelve Deister Overstrom No. 6 diagonal slime tables
30. Three Dorr Simplex rake classifiers, each 2 ft 3 in. x 14 ft 8 in.
31. Second sand table floor. Three Deister Overstrom No. 6's; six Plat-O-Deisters
32. Six 6x18-ft Dorr Duplex rake classifiers
33. One Allis-Chalmers 5x5-ft ball mill and one Allis-Chalmers 4x10-ft rod mill
34. Two Wilfley 4-in. centrifugal sand pumps
35. Two 4x10-ft and four 5x10-ft Allis-Chalmers rod mills
36. Second slime table floor; 18 Deister Overstrom No. 6's with slime deck
37. One 4-spigot Fahrenwald classifier
38. Two 4-in. and two 5-in. Wilfley sand pumps
39. Eighteen Fahrenwald 6-in. cones
40. Special table floor. One Deister Overstrom No. 6; four Plat-O-Deisters
41. Third sand table floor. One Deister Overstrom No. 6; six Plat-O-Deisters
42. Third slime table floor. Seventeen Deister Overstrom No. 6 slime tables
43. Two Wilfley 3-in. sand pumps
44. Four 6-in. Fahrenwald cones
45. Two 5x5 Allis-Chalmers sand pumps
46. Fourth sand table floor. Four Deister Overstrom No. 6's; six Plat-O-Deisters
47. Two Wilfley 2-in. sand pumps
48. Fourth slime table floor. Four Deister Overstrom No. 6's
49. Four Esperanza-type, 5-ft drag classifiers
50. Two Wilfley 3-in. sand pumps
51. Two 3-in. Wilfley sand pumps
52. Sullivan plant. Fifteen 5-deck Buckman tilting tables. Decks are rubber. Plant treats 400 tpd. Feed assays 0.68% Sn. Concentrate assays 1.62% Sn. Tailings run 0.5% Sn. Concentration ratio is 8:1
53. One 8x6-in. and one 10x8-in. Allis-Chalmers SRL sand pump
54. Fifth sand-slime table floor. Eight Deister Overstrom No. 6's
55. Two 30-ft dia Dorr thickeners
56. One 6-ft Dorr bowl classifier
57. Two Wilfley 3-in. sand pumps
58. One 3-in. Wilfley sand pump
59. Two 4-in. Wilfley sand pumps
60. One 20-in. belt conveyor
61. Sixth sand-slime table floor. Two Deister Overstrom No. 6's; two Plat-O-Deisters
62. Four 4-spigot Fahrenwald classifiers
63. One Denver 20-ft dia Hydroclassifier
64. One 60-ft Dorr thickener
65. One 3x6-ft Denver-Dillon screen
66. Two 5x5-in. SRL Allis-Chalmers sand pumps
67. Bin—500 tons
68. Pilot plant. Four Dutch 20-in. dia cyclones split the feed to a 30-ft thickener and two jigs. Two Panam-K 42x42-in. jigs make a concentrate for four Deister Overstrom No. 6 tables. Table tails go to pond. Table sands go to stockpile. Table concentrate goes to main plant.

Tailings from the two Panam-K jigs go to a second bank of four 42x42 Panam-K jigs that make a concentrate and a tailing for the pond. This concentrate goes to two Deister Overstrom No. 6 tables that make a final concentrate and a tailing for the pond.

Going back to the 30-ft thickener—overflow goes to two Dutch 20-in. dia cyclones whose overflow goes to tailings. Cyclone underflow goes to four 42x42-in. Panam-K jigs that make a concentrate for two Deister Overstrom No. 6 tables and a tailing for the pond. Table concentrate goes to main plant and tailings to the pond.

Underflow from the 30-ft thickener (above) goes to one 42x42-in. Panam-K jig whose tailings enter the first mentioned bank of four Panam-K jigs above, and whose concentrate goes to the first-mentioned bank of Deister tables

69. Tramway for tailing sand disposal. In 1956, tailings assayed 0.38% Sn. These tailings represent 60% of all tails
70. Two Wilfley 8-in. sand pumps

Flotation Plant Included In Flowsheet Legend

71. One 75-ft Dorr thickener
72. Dorr thickener—120 ft dia
73. Three-stage pumping with four 8-in. Wilfley sand pumps
74. Two 8x6-in. Allis-Chalmers centrifugal water pumps, Type S. I.
75. Three 10x8-in. Allis-Chalmers centrifugal water pumps, Type S. I.
76. Settling pond. Slime tailings assayed 0.46% Sn. in 1956. Slimes represent 40% of all tailings.
77. One 70-ft dia clear water tank
78. One 80-ft dia clear water tank
79. Old tailings rejected from the older Victoria workings. They run about 0.7% Sn
80. Bin—600-ton
81. Conveyor, 24-in.
82. Conveyor, 24-in.
83. Two 6x6-ft Marcy No. 66 ball mills provide two separate mill circuits. We'll discuss one here and the other circuit starting at No. 93
84. One 4x14-ft Allis-Chalmers Low-Head screen splits the ball mill discharge at 1mm. Plus 1mm goes to second stage grinding. Minus 1mm goes to No. 85
85. Four Panam-K jigs, each 42x42-in., treat minus 1mm. Concentrate goes to No. 86. Tails go to No. 88
86. One Panam-K 42x42-in. jig. Recleaned concentrate goes to No. 87. Tailings enter classifier
87. One Plat-O-Deister table making a finished concentrate and a classifier feed
88. One 6x18-ft Dorr Duplex rake classifier feeds sand to rod mill (89) and overflows to Wilfley pumps (89')
89. One 5x10-ft Allis-Chalmers rod mill
89'. Two Wilfley 6-in. centrifugal sand pumps that feed to a splitter box that feeds the jigs
90. Sixteen 42x42-in. Panam-K jigs making a concentrate for Victoria Mill and a tailings
91. Two Wilfley 4-in. concentrate pumps
92. Two Wilfley 8-in. cyclone feed pumps deliver jig tails (90) to cyclones
93. Four 20-in. dia cyclones size jigs tailings, with overflow going to tailings pumps (94) and underflow going back to the rod mill circuit

Second ball mill circuit (83) duplicates steps 84 to 89.

94. Tailings pumps are two Wilfley 8-in. centrifugal sand pumps
95. Tailings pond. Slimes assay about 0.5% Sn
96. Flotation plant. From a 50-ton bin, feed is drawn by a 30-in. conveyor to a 5x10-ft Allis-Chalmers rod mill, in closed circuit, with a 6-ft Dorr Duplex rake. Classifier overflow goes to a 6x9-ft conditioner that underflows to a six-cell bank of Massco-Fahrenwald flotation machines, and that overflows to sump pumps below.

From the Massco cells, overflow from the back four cells goes to the same sump below. Overflow from the first two Massco cells enters No. 5 cell of an 8-cell bank of No. 18 Denver machines.

Denver cells move the sulphide concentrate forward and out. Denver tails go to a sump pump and there join the pulp from the Massco overflow and the conditioner overflow. This pump enters a classifier in closed circuit with the rod mill (above). Classifier overflow goes to the 6x9-ft conditioner.

Sulphide from the Denver cells goes to a Deister table that cuts out a heavy sand for the sump pump (above) and sends a side product to the sulphide tailings pump (97).

Back at the Massco cells for a minute—cleaned underflow, bearing the tin, is sent to a second Deister table that makes a heavy, tin-bearing concentrate for the thickener (98); or else, the Massco underflow goes direct to the thickener

97. Flotation plant sulphide tailings are pumped away through a Wilfley 4-in. pump. Sulphides assay 0.9% Sn
98. One 50-ft dia Dorr thickener overflows clear water to waste and underflows concentrate to No. 99
99. One 6x8-ft Oliver drum filter to dewater tin concentrates
100. Concentrates are dried for export

The upward current passing through the slots between the triangular bars (U) readily lifts the rubber balls of low gravity, thus allowing the pulp mass a free passage through the slots at low velocity. The low velocity current carries with it the suspended light gangue particles and overflows the tailings discharge lip (E).

The rapid down stroke of the hutch following the upstroke tends to form a strong vacuum underneath the grating; the rubber balls settle quickly in their grooves leaving small open spaces between them. Vacuum, together with the head column pressure above the grating, accelerates the pulp through the small openings between the balls, forming a large number of fine high velocity jets.

These jets impart to their constituent particles a high degree of kinetic energy in proportion to their size and specific gravity. Particles with higher kinetic energy have greater penetrating power to overcome the drag and viscosity resistance of the slowly rising pulp and hutch water and so reach the bottom of the hutch while the lighter gangue particles are carried with the slowly rising current to the surface and overflow.

Hutch product consisting of fine heavy mineral particles and relatively coarse gangue particles is fed to tables for retreatment. Rubber-covered tables treat the deslimed feed effectively, separating the coarse sands from the heavier fine minerals, thus securing good grade of concentrates together with a satisfactory recovery of cassiterite.

Flotation Plant

All jig and table concentrates go to the flotation plant where they are reground and then treated in Massco-Fahrenwald and Denver flotation machines, for the removal of pyrites and other sulphides. The non-float which is the final concentrate is settled, filtered, dried and sacked for export to England. Pyrite tailings are pumped to settling ponds.

Reagents used in flotation plant

Pine Oil	1.60 lb per ton
Xanthate	0.97 lb per ton
Barret No. 4	0.75 lb per ton

Mine water used in the plant is acid. It has a pH of about 3.0. Therefore, normally, no additional acid is required in the plant. During the rainy season some sulphuric acid is added to get a pH of 3.0.

The amounts of reagents being used are large but it seems that with lesser amounts the results are not satisfactory. Tin recovery in the non-float is around 98%. The sulphur content in the concentrates is kept below 1% at all times.

Historical Data

Empresa Minera de Catavi is situated in the Province of Uncia of the Department of Potosi in Bolivia. The mine, located in Llallagua or Siglo XX, is considered the richest tin vein structure and the most productive in the world. The mine has been worked since the beginning of this century and has produced over 500,000 tons of fine tin since the year 1901.

Originally the ore deposit was discovered and worked by the industrialist Simon I. Patino and later also by the Cia. Estanifera de Llallagua, a Chilean company. In the year 1924, Patino managed to get control of all the operations and formed the Patino Mines E. C. & I. That enterprise introduced a system of workings and development that resulted in Catavi being the largest tin lode in the world, a modern mine and the largest concentrator for the treatment of tin minerals.

On October 31, 1952, the Patino Mines E. C. & I. was nationalized by the Bolivian government. Since then Corporacion Minera de Bolivia took control of the mines and organized in Catavi the Empresa Minera de Catavi.

According to Ahlfeld, the mine heads in 1908 assayed from 12% to 15% Sn, and in 1924 went down to 9%. At this time the mine heads assay from 0.80% to 0.90% Sn. For this reason, taking into consideration the progressively decreasing assay values of the mine ore, the exploitation of

Union Carbide's uranium mill, Uravan, Colo.

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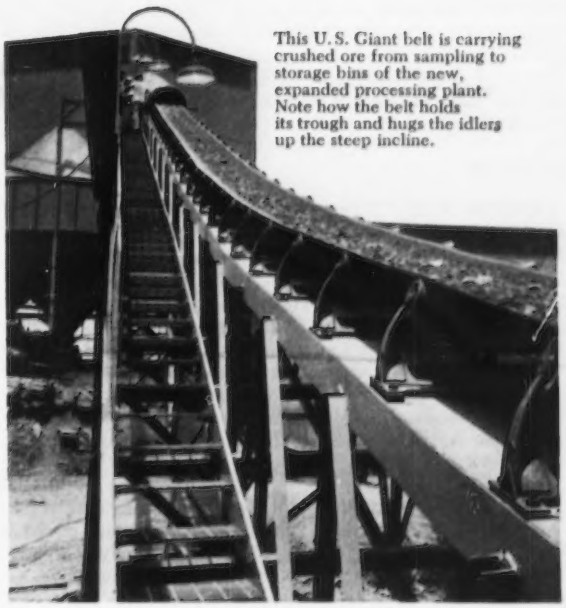

This U.S. Giant belt is carrying crushed ore from sampling to storage bins of the new, expanded processing plant. Note how the belt holds its trough and hugs the idlers up the steep incline.

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the Cerro Llallagua over a period of 53 years may be divided into the following stages:

1903 to 1923. Relatively crude working was done at Miraflores mill belonging to Don Simon J. Patino and the Victoria mill which belonged to the Cia. Estanifera de Llallagua. During that bonanza period the assay of the mine ores varied between 9% and 15% Sn. Mill equipment consisted of jigs, shaking tables and buddles.

1924 to 1945. During this period Patino Mines improved all-works of the enterprise. Victoria mill in Catavi was completely overhauled and the Miraflores mill was dismantled.

The system of concentration consisted of a hand sorting plant in Siglo XX, in which tailings with 0.5% to 0.6% Sn were discarded while the selected ore was shipped to Catavi in railroad cars to be treated in the Victoria mill.

Flotation Replaced Roasting

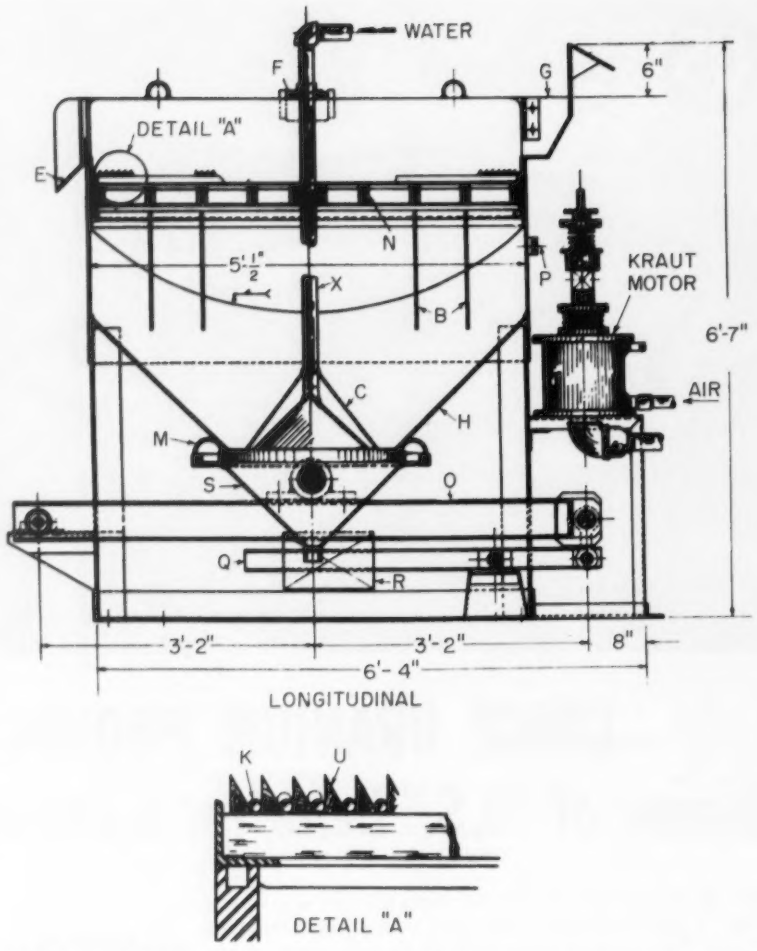
The treatment consisted in secondary crushing and classification with vibratory screens, followed by jigs, tables and buddles. Concentrates consisted mainly of cassiterite, pyrites and other sulphides. These were then subjected to an oxidizing roast in Kauffman furnaces and recleaned on tables.

With the introduction of flotation in 1926, the roasting process was gradually eliminated until, in 1932, it was entirely abandoned. During this period the mine ore values gradually decreased from 6.65% Sn to 1.92% Sn. To compensate for the loss in values of the ore, the mill capacity of the Victoria mill was increased proportionally.

1945 to 1952. During this period the low grade of the mine ores obliged Patino to take new steps to improve the production of tin. First a sink-float plant was installed, which used pyrites as a heavy medium. This plant proved to be a failure. Later this plant was dismantled and a new sink-float plant was constructed using galena as a heavy medium. This plant also proved to be inadequate for the following reasons:

(1) difficulty in obtaining a satisfactory recovery of the galena by flotation because of various causes; and (2) the galena not recovered contaminated the export cassiterite concentrates.

After these two fruitless attempts, Patino decided to build a new sink-float plant using ferrosilicon as a medium. This plant went into operation in May 1949 and is working satisfactorily to this date.



EXPERIMENTAL slime concentrator gives satisfactory results on cassiterite slimes. Rubber balls placed in grooves between bars (U) regulate pulp-water velocities.

During this period the mine ore assays decreased from 1.92% Sn to 1.11% Sn.

1952 to Date. On October 31, 1952, the government of Bolivia nationalized the three principal mining enterprises of the country, i.e. Patino Mines and Enterprises, Cia. Minera Hochschild and Aramayo Mines Co. Of these, the Llallagua tin deposit was predominantly the most important.

For the purpose of continuing operations in this district the Empresa Minera de Catavi was organized as a dependent of the Corporacion Minera de Bolivia. When the new company took over the average mine heads assayed 1.11% Sn.

In the following years the impoverishment of the mine heads continued and, of course, production of tin decreased alarmingly. To overcome this state of affairs some changes were made in the sink-float plant. With these changes at relatively small cost, capacity of the plant was increased from 4,000 tpd in times of Patino, to 5,000 tpd to this time.

However, that was not sufficient to compensate for the lowering of the mine head assays.

In the circumstances it was decided that an auxiliary plant to the Victoria mill, called the Panam-K Jig plant, be built. This plant increased the capacity by about 50%. Unfortunately, due to the shortage of rain and consequent crisis in the supply of electrical current, it has not been possible to operate this plant at full capacity.

Since the plant started operation in February 1956, only 38% of its capacity has been utilized.

The writer wishes to thank Herbert Weisz, general manager of Empresa Minera de Catavi, for permission to publish this paper. He also wishes to acknowledge the assistance of Messrs. Luis Maldonado, Isaac Solano, and Roberto Camargo in preparing this paper.

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Every kind of steel, every shape and size is available from the world's largest stocks at Ryerson —ready for shipment on the schedule you set . . . on the day you select.

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OPERATING IDEAS

Wobbler Grizzly Reduces Costs

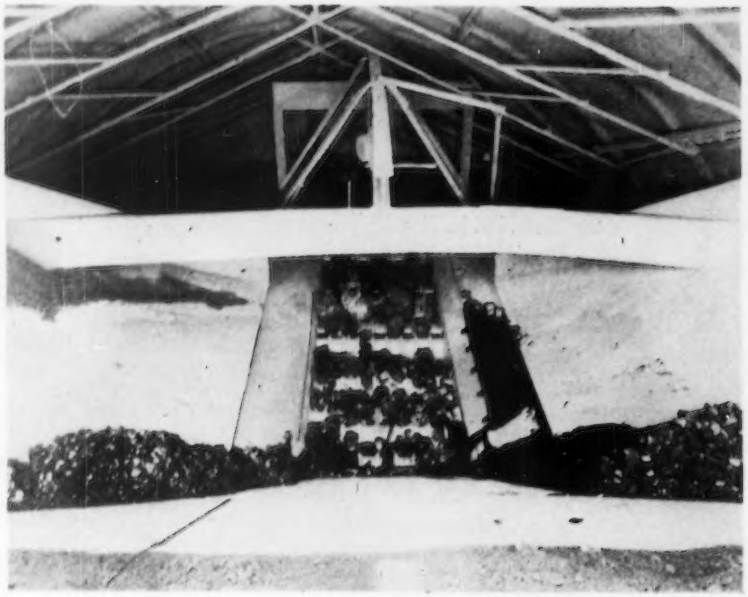
MAINTENANCE cut from two days a week to four hours a month plus elimination of bar-cleaning crane are results of replacing bar grizzly with Universal Wobbler Feeder at Thomas Connelly Co., Hammond, Ind., according to Jack Harrington, plant engineer.

Each eight-hour working day about 6400 tons of slag—60 to 70 sixty-ton trailer loads from open hearths, alternated with 10- to 20-ton loads from blast furnaces—are handled. Processing involves magnetic recovery of iron plus crushing and screening.

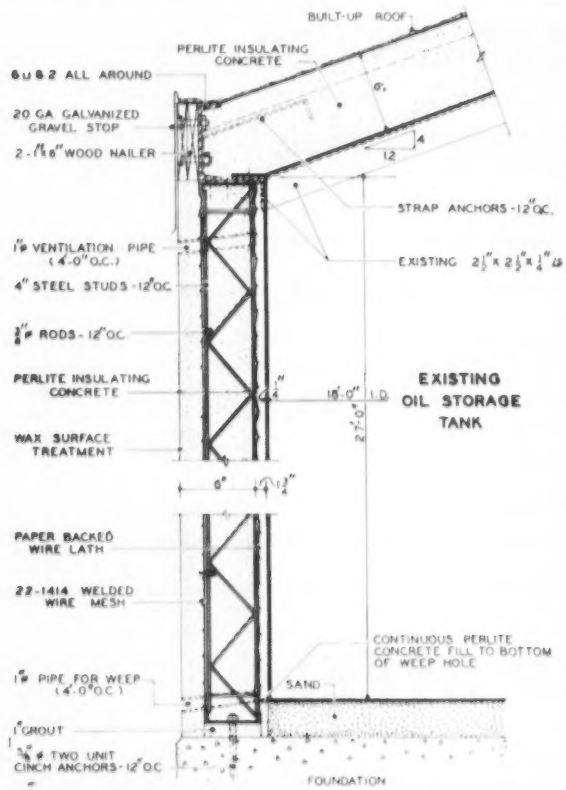
"Up till November 1956, we used a bar grizzly to separate fines from oversize ahead of the screens. With the grizzly we had to use one of our cranes full time to keep the bars cleaned off. This meant a loss of $3,500 a month we could have been getting in rental money on the crane.

"So we replaced the grizzly with a Universal Wobbler Feeder and it's been a big improvement. It not only freed the crane, but cut down our previous maintenance time to four hours a month.

"With the grizzly, we had two days welding time a week. So far, we don't see any wear on the Wobbler. This machine has handled more than half a million tons of slag for us—and before that, about a third of a million tons of granite for the Fisher Contracting Co. at the Montgomery Dam, Alma, Colo."



Feeder is at bottom of hopper under a dust-confining Quonset-type roof. Unit operates on 15hp and is a 12½-in. pitch, 13-bar, 60-in. bed width model made of self-hardening manganese steel. Graduated openings between bars—increasing from 3-in. at feed end, up to 6-in. at other end—distribute load over entire length of feeder and keep fines from surging through at feed end. Other models can separate down to minus ½-in. First model was used on Mesabi taconite in 1950.


BUILT-UP ROOF
PERLITE INSULATING CONCRETE
6 u 8.2 ALL AROUND
20 GA. GALVANIZED GRAVEL STOP
2 - 1" x 6" WOOD NAILER
STRAP ANCHORS - 12" OC.
EXISTING 2½" x 2½" x ¼" ∠
1" ø VENTILATION PIPE (4'-0" O.C.)
4" STEEL STUDS - 12" OC.
⅜" ø RODS - 12" OC.
PERLITE INSULATING CONCRETE
WAX SURFACE TREATMENT
EXISTING OIL STORAGE TANK
16'-0" I.D.
PAPER BACKED WIRE LATH
2 2-1414 WELDED WIRE MESH
CONTINUOUS PERLITE CONCRETE FILL TO BOTTOM OF WEEP HOLE
1" ø PIPE FOR WEEP (4'-0" O.C.)
SAND
1" GROUT
⅝" ø TWO UNIT CINCH ANCHORS - 12" OC.
FOUNDATION

Perlite Concrete Protects Tanks

PROTECTION from fire, evaporation losses, and weather corrosion for fuel oil storage tanks is gained by a shell of perlite concrete at U.S. Gypsum's Philadelphia plant. Fireproof characteristic also permits enlarging of nearby buildings by reducing tank site area requirements. Three 18-ft dia, 27-ft high, 50,000 gal tanks were covered.

Material is rot- and vermin-proof, easily maintained and pleasing to the eye. It is lightweight—heat-expanded perlite weighs 1/10th an equal volume of sand—with low expansion and high insulation characteristics. The qualities suggest its use for many mine structures.

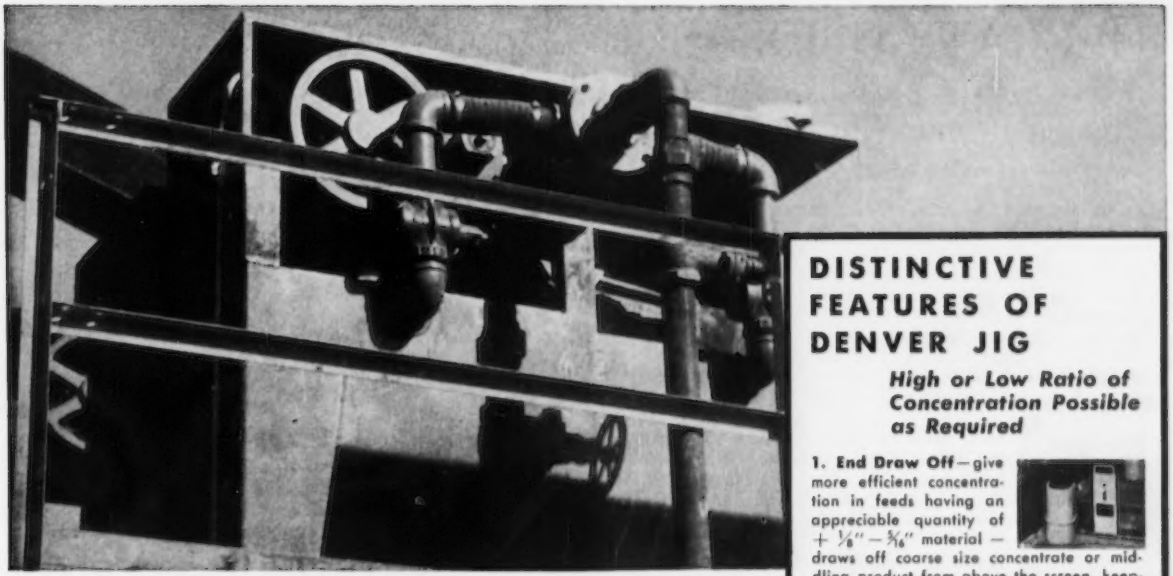
Multiple layers of perlite concrete totalling 6-in. were sprayed onto a paper-backed wire lath attached to a Trussteel stud framework built around the tanks. This framework was connected only at the top of each tank and to a runner circling the base. Thus the perlite shell was structurally independent of the tank and left a 1¾ in. dead-air space between it and the tank. The perlite concrete shell plus air space passes only 0.16 Btu per hr per sq ft per deg F temperature difference. This is equivalent in insulation value to over 3 ft of structural concrete.

When completed the shell was water-proofed with a special wax preparation. Tank tops were also protected by perlite insulating concrete and then covered with 4-ply membrane gravel roofs.

Composition of the concrete mix used was: 4 cu ft Perlite to one bag Portland cement, 5 lb Lumnite cement, 3 oz NVX air entraining agent (vinol resin solution) and 62 to 64 lb water.

Perlite concrete sprayed walls of this construction are approved for 4-hr retardant ratings. This suggests their use in other mine construction.

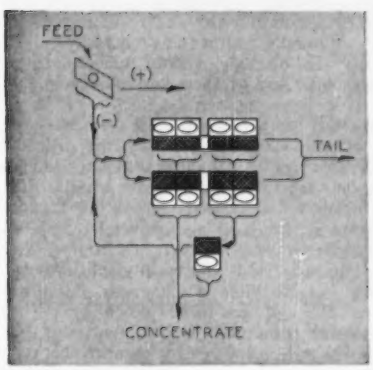
Richard S. Funk, Perlite Institute, 45 W. 45th St., N.Y.C. contributed this item.



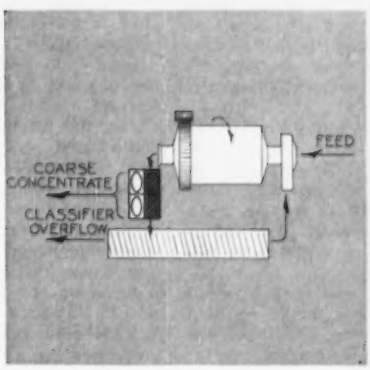
DENVER JIGS

NEW DESIGN . . . PROVEN PRINCIPLE . . .
PRACTICAL METHOD OF SELECTIVE GRAVITY CONCENTRATION

OPEN CIRCUIT



CLOSED CIRCUIT



Arthur C. Daman, Jr., a graduate engineer with considerable field experience, specializes in Jig operation and is available to help solve your gravity concentration problem, recover your mineral as soon as freed. Send 20 lb. sample of your ore by parcel post for Jig test. We will have our laboratory run tests and send products to you for evaluation. No charge.

DISTINCTIVE FEATURES OF DENVER JIG

High or Low Ratio of Concentration Possible as Required

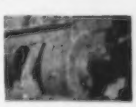
1. End Draw Off—give more efficient concentration in feeds having an appreciable quantity of $+\frac{1}{8}" - \frac{3}{16}"$ material — draws off coarse size concentrate or middling product from above the screen, keeping jig bed alive and free from packing.

2. Water Valve—allows water to enter hutch to replace diaphragm displacement on the upward stroke. Gives true hindered settling because suction down through bed is eliminated. Minimizes water consumption. Adds flexibility and selectivity to jig.

3. Denver Dowsett Valve — provides automatic discharge of the hutch product without disturbing the jigging action and also reduces water consumption when ratio of concentration is low.

4. Roller Bearing Eccentrics—reduces friction and puts more trouble free service at the point of greatest wear—assures continuous 24 hour service.

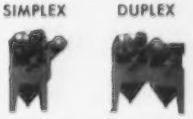
5. Sturdy Construction — heavy steel plate is used on frame, legs, tank and hutch compartment. All seams double welded. Minimum floor space is used.



6. Simple Stroke Adjustment—permits easy variation of the length of stroke. The operator can easily change jigging action to get maximum recovery at all times.

7. QUICK DELIVERY

SIMPLEX DUPLEX



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OPERATING IDEAS (*Continued*)

Thread Inserts Cut Crusher Cost

CRUSHER DOWNTIME to repair damaged plate-holding bolt threads on crusher core, expensive both in manpower and production time, has now been greatly cut by a system of thread inserts.

Since the countersunk holes for fastening the chilled iron replacement wear plates to the core are of standard size, it is impractical to redrill the core and tap for the next larger size. Engineers of Heli-Coil Corp. resorted to a technique that did not change the thread diameter.

Here's the operation: (1) redrill damaged threads to a slightly larger diameter, (2) retap hole with the standard Heli-Coil tap, and (3) install stainless steel wire insert.

When threads became excessively worn, the only previous remedy was a replacement with new mandrels. This required disassembly of the crusher and transportation of the shaft assembly with mandrel to a shop having an adequate press. Now worn threads can be drilled out, retapped and wire inserts installed to provide permanent threads of the original size without taking the machine apart.

Heli-Coil states that no amount of vibration will loosen the insert and, being stainless steel, it will not corrode. Consequently, wear plates can be set up as tight as possible on the core (up to 4,000 ft-lb have been applied on heat treated bolts to fasten the wear plate to the core).

Firm also states that the strength of the 18-8 stainless steel wire used in the manufacture of these inserts make them stronger and more permanent than either the original threads or those repaired by other methods.

Replacing Steel Locomotive Tires Can Be Simple

REPLACING steel locomotive tires can often be such a chore that their many advantages look less attractive. Paul Ziemke, Clinton, Tenn., says this need not be so.

To remove a tire fast: drill a 1-in. dia hole ⅞ths of the way through rim, parallel to wheel face; tamp it full of high grade dynamite; insert a detonator; and then burst it off like a ripe cotton pod. This latest method is much simpler than heating with an oxyacteylene torch and a far cry from applying external heat while trying to keep core cool with ice, snow or a stream of water.

To apply a new tire, heat it slowly and uniformly around the circumference. While an oxyacetylene torch can be used, heat is best applied indirectly to prevent flame damage to surface. An electrical coil of proper turns and wire size achieves heating best of all, but it may prove expensive if there are a variety of wheel sizes. Temperature should range from 500 to 600 deg F for average tire. In no case should it rise above 800 deg, which is just below visible red heat.

Before placing tire on wheel core, see that bore is wiped clean of all dust and soot. Fins or gashes should be filed smooth. Center tire carefully over core and let it down smoothly until it rests evenly on blocking laid under core at equidistant points. One may use a soft copper hammer at suitable points that require a bit of "urging," but don't use sledge hammers, flatters, rams or pressure from above. That type of application is confessing the fact that either the tire was not sufficiently heated or else the core or tire was not the right size or a perfect circle.

After placement, the perfectionist swings the wheel set in a lathe to make sure of true concentricity and matching size of both wheels. A light cut usually restores any misfits.

Finally, don't identify tires by digit or letter punches, center punch marks or chisel cuts. Any of these can start a line of fracture when wheel is in heavy service.

The steel locomotive tire has a host of advantages over the chilled cast wheel of ordinary construction. Mr. Ziemke says: Although hard, close grain structure reduces traction somewhat, steel tires outwear three to four cast wheels. First cost is considerably higher for steel-tired wheels, but because of tire's uniform texture it rarely, if ever, must be replaced because of flange breakage or tread flatspots. Of course, with time flanges do wear knife-edge thin and readily split switches if these are not tightly locked. When this happens, the wheel set can be placed in a lathe and rims turned down.

Tires need be removed from core only when wear has progressed to a point where insufficient clearance between locomotive frame and trackage develops. This is after a good many miles and is no real job, if the pop-off scheme is used.

Air Bubbles Cut Arctic Freeze-Up

COMPRESSED AIR, pumped through an underwater perforated plastic pipe to create air bubbles, forces slightly warmer bottom water to the surface to melt five ft thick ice on Great Bear Lake, Northwest Territories, Canada.

El Dorado Mining & Refining Ltd., at lakeside Port Radium, is now able to keep a suction pipe dredge operating all year to reclaim tailings piled under Great Bear's waters. "Bubbler" system may be the solution to one of the major problems holding up mining and industrial development in far-northern Canada.

System is in use elsewhere by lumbermen to eliminate ice on log storage ponds and lumber intakes at sawmills. Ferry operators in Quebec find the system an effective and cheaper method of keeping channels free of ice.

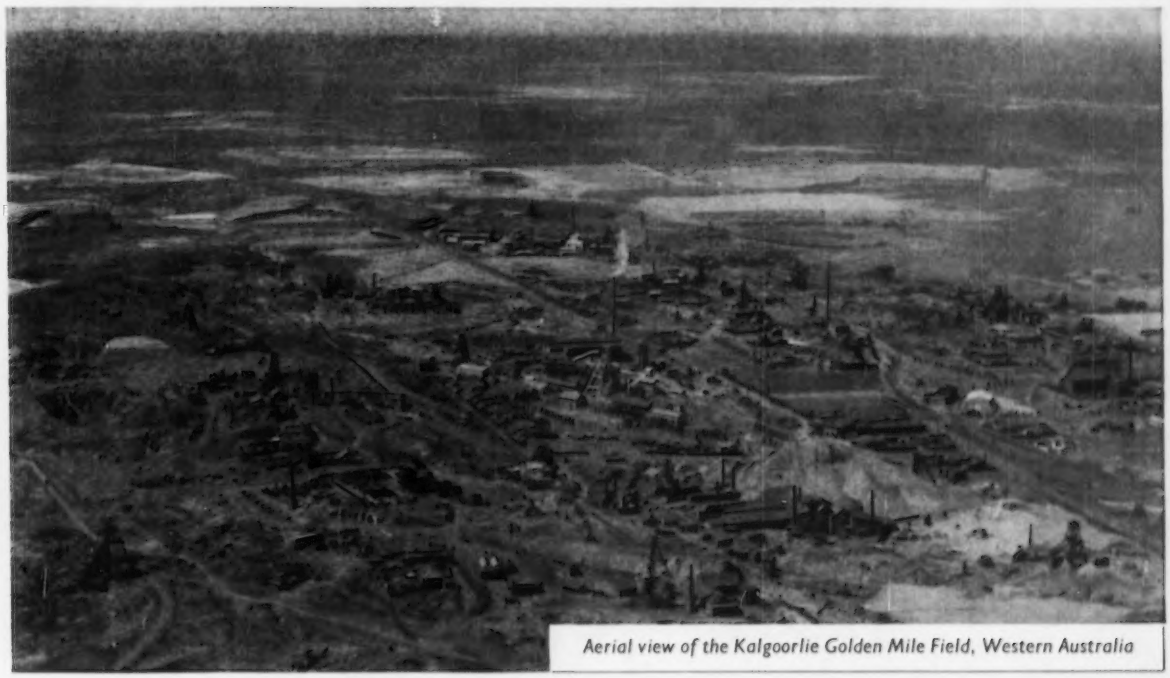
Gamma Alarms Help U_3O_8 Sorters

MORE ACCURATE uranium ore-sorting is promoted by an automatic scintillometer alarm scheme at several South African mines.

When high-grade is to be picked, two scintillometers are placed under the incoming ore belt and whenever any uranium ore passes over them, bell and light signals are triggered, indicating the ore's position on the belt.

These signals serve as a warning to geiger-counter-equipped sorters along the belt, who then find and pick out the uranium ore more quickly and accurately.

In mines where waste material is being picked-off, scintillometers on the waste discharge conveyor detect any misplaced uranium ore. At present, 14 mines are either equipped with scintillometers or have them on order.



Aerial view of the Kalgoorlie Golden Mile Field, Western Australia

Kalgoorlie fights rising costs

THE Kalgoorlie goldfield in Western Australia has produced 30,000,000 ounces of gold since 1893. It still produces 500,000 ounces yearly, but post-war rises in wages and prices almost put the cost of mining it right up to the market price for gold. To restore the economics of the operation, new techniques were adopted—one of the most important was the introduction, throughout Kalgoorlie's Golden Mile, of integral drill steels tipped with tungsten carbide, and light pusher leg mounted jackhammers.

In 1950, Atlas Copco light rock drills with pusher legs and Sandvik Coromant drill steels were introduced on the Golden Mile. Soon all mines on the field had converted to the economical new system of drilling, in which Atlas Copco played a major role. The result was an overall increase of 75% in feet drilled per machine shift and 55% increase in ore broken in stopes per machine shift.

Still more efficient Atlas Copco rock drill and more versatile Sandvik Coromant drill steels are being made available to reduce production costs still further on the Golden Mile.

An Atlas Copco rock drill operating in a confined space at the gold mines of Kalgoorlie.

Write, phone or cable today for further details to any of the addresses below:

Atlas Copco

EASTERN *P.O. Box 2568 Paterson 25, N.J.* **PACIFIC** *930 Brittan Av, San Carlos, Calif.*
CANADA *Montreal Airport, Quebec.* **MEXICO** *Apartado Postal 56, Torreon, Coahuila.*

OSS 10A

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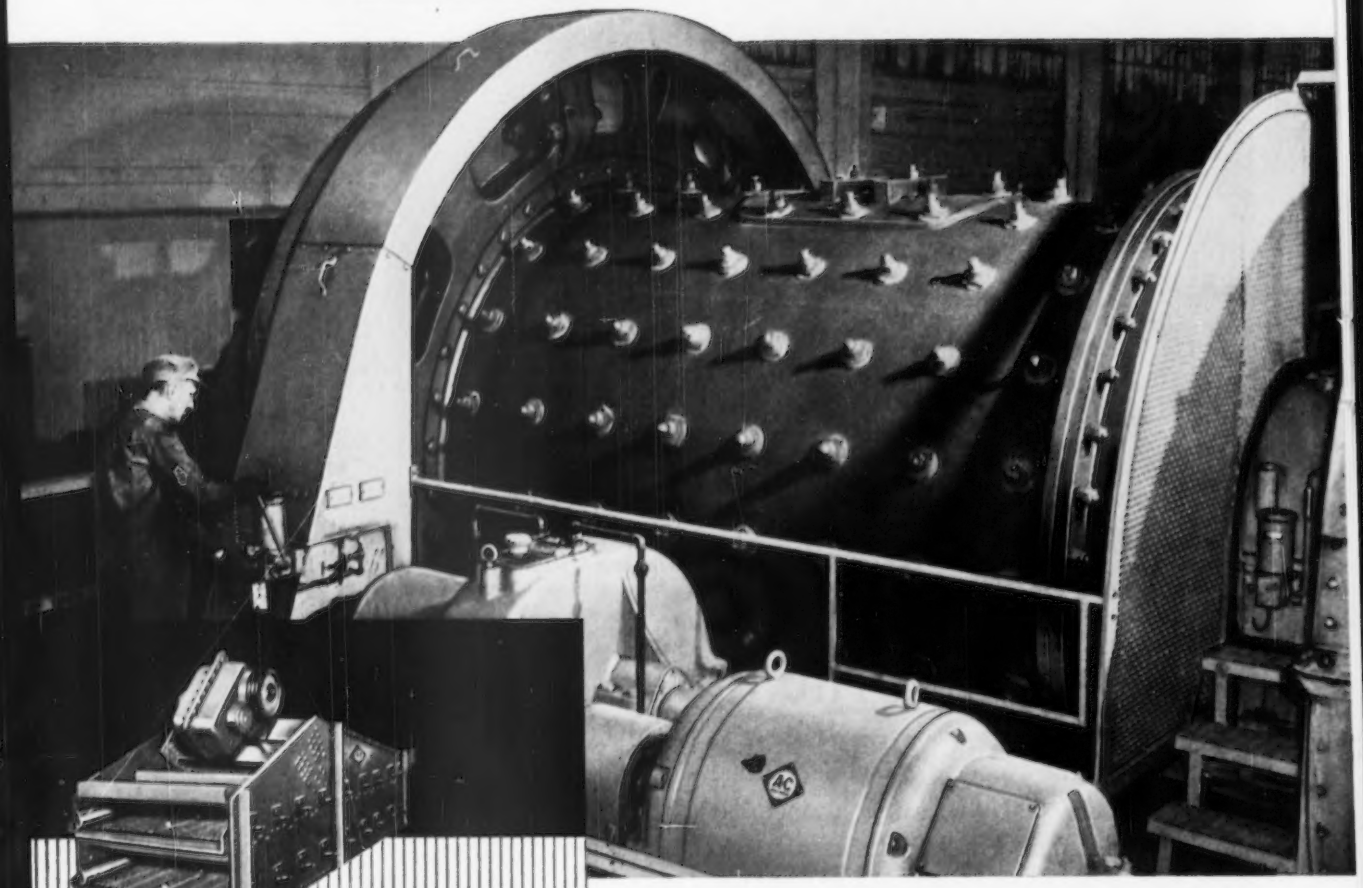
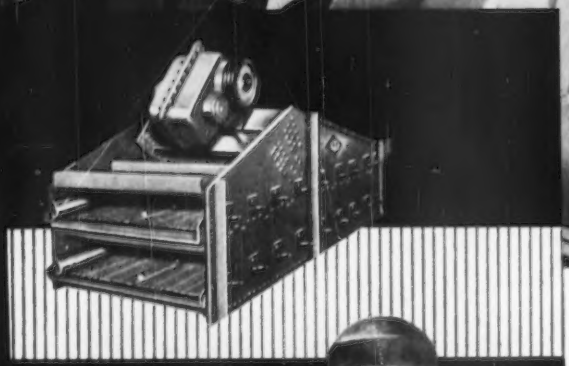
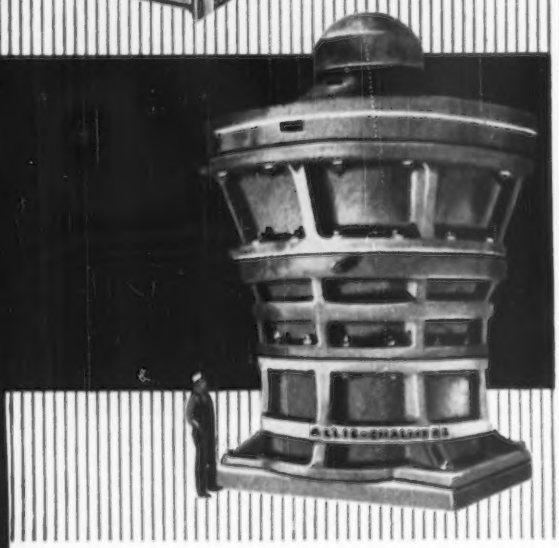




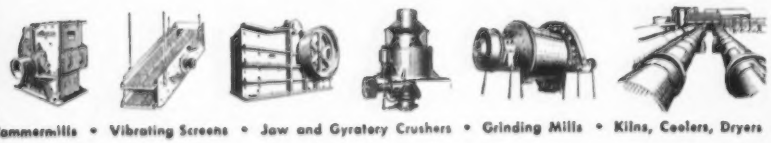


"Coordineered" Equipment for the Mining and Rock Products Industries

GRINDING MILLS—Whether your process calls for individual mills or a grouped stage grinding series, Allis-Chalmers can make a right-for-the-job recommendation from seven different types of grinding mills.

VIBRATING SCREENS—Allis-Chalmers screens are built in single and multiple-deck models for use in scalping, wet or dry sizing, washing, rinsing, dewatering, and media recovery.

GYRATORY CRUSHERS — "One-man, one-minute product control" slashes the time it takes to change crusher setting from hours to seconds. Size adjustment, compensation for wear and emergency unloading are accomplished at the flick of a switch.



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The Plus is the "Coordineered" Approach to Equipment Development and Application

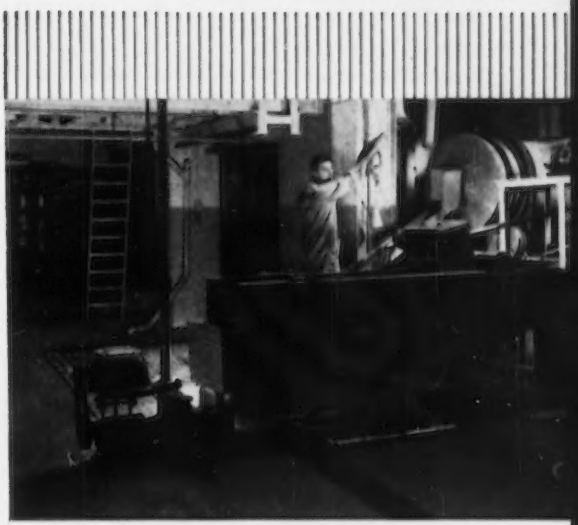
BECAUSE Allis-Chalmers makes so many types of equipment used in the mining industry, it is the *one* company that can team up its thinking, planning and engineering in designing, building and application. We call it "coordineering."

In this unique approach, your A-C team draws from a background of over a century of experience and an unparalleled concentration of field and laboratory data . . . detailed information on the processing of practically every material mined and quarried throughout the world.

Better Equipment, Better Methods, Better Results for You

The utilization of this experience and intimate knowledge of your requirements has, of course, influenced the outstanding development and advanced design of Allis-Chalmers equipment. But more than that, these factors, combined with A-C diversification, have made possible the "coordineering" of related equipment in smooth, profitable processing arrangements in plants everywhere.

For more about the "more" you get, see your Allis-Chalmers representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.



The A-C laboratory is one of the best equipped, best staffed in all industry. Information obtained in laboratory and pilot plant testing helps determine the equipment and process best suited to a given application.

This bulletin with its explanation of the "work index" formula enables you to evaluate any size reduction operation . . . compare efficiency of plants, circuits and machine. It offers the only practical approach to improving performance . . . of determining the right machine for a job. Write for Bulletin 07R7995.

CHALMERS

A-C ALLIS-CHALMERS

A-5114

ELEMENTAL PHOSPHORUS is produced at Tarpon Springs from low-grade pebble rock and concentrates purchased from local producers. Victor's thorough safety program has led to an enviable record of 1,491 consecutive no-lost-time work days.

How Victor Chemical's Safety Program

STARTING with a simple program, Victor got the individual thinking about himself and safety. The real enthusiasm for safety began after a few weeks of no accidents.

"SAFETY report is made each month"—Lex Hutcheson, production supervisor.

"SAFETY signs are changed frequently" —E. A. Holtgrewe, superintendent.

PLANT-WIDE safety meetings are held once a month with a guest speaker from an outside company. Occasionally, as the situation demands, impromptu meetings are held by E. A. Holtgrewe to talk about safety, housekeeping and near-misses.

Reduces Accidents, Cuts Costs

"SAFETY CAN BE OBTAINED and need not cost you very much. You can spend a fortune and not achieve safety—if you don't do the job right," said E. A. Holtgrewe, superintendent, Victor Chemical Works' Tarpon Springs elemental phosphorus plant. This was his first comment in response to our question of how do you go about getting a good safety program.

Just how good a safety program Tarpon Springs has can be seen from the total consecutive number of no-lost-time days that stood at 1,491 days on June 24. Tarpon Springs didn't always have such a good record. And that's what we went to Tarpon Springs to find out. How did an elemental phosphorus producer reduce his accident rate to zero? Here's what we found.

Tarpon Springs went onstream in 1947 and had a poor accident rate. From 1947 to 1952, Victor's accident costs ran between $5- and $10,000 a year. There was a safety program in effect, but not until management and the men themselves made up their minds to work for safety did they get good results.

Victor started out with a simple program. They wanted to get the individual employee thinking about himself and safety. Then they put a little more beef into the program, starting out with these five safety rules:

1. Employees must wear proper, well fitting clothing and safety shoes, where required;
2. A hat or a hard hat is required for all;
3. Everybody has to have goggles or safety glasses;
4. Gloves are to be worn; and, finally,
5. Long sleeve shirts are a must.

In the beginning, foreign-particle-in-the-eye cases ran 80 to 90 a month. Even occasional phosphorus skin burns were incurred. One death and one lost eye accident were on the record.

The real enthusiasm for a safety program began in May 1952 after the employees had racked up a few weeks of no lost-time accidents. The program can be broken down into these phases—

1. Safety equipment;
2. Ideas and aids;
3. Training;
4. House cleaning; and
5. Community relations.

Safety equipment rules used to start the early program are still enforced. Rubber rain gear is furnished where needed. Victor will furnish anything an employee feels he needs for safe working. And the company makes each man responsible for all safety equipment issued to him.

Ideas and aids keep the program fluid. Safety signs and slogans are changed frequently. Even the location of key safety signs is changed. Big safety signs as shown on these pages were erected. Some signs are flashing neon, others are metal. The signs cost about $70 each, but management feels that they are worth it, since the employees feel that if the management is willing to spend money on safety, then there must be something in it for the employee.

Accidents Go Down When Safety Programs Take Hold

Victor Chemical Works' Tarpon Springs Safety Record

	1957	1956	1955	1954	1953	1952	1951	1950	1949	1948	1947
Total reportable accidents	3	35	20	31	42	35	90	106	60	77	Plant
Lost time accidents	0	0	0	0	1	2	3	6	3	9	started
Total man-days lost time	0	0	0	0	64	55	15	6000*	1907**	439	construction

*one fatality **lost eye

(Continued on page 120)

Direct-current System Powers

Bucyrus-Erie's Giant "River Queen"

Direct-current drive system proves best source of both power and control—vital factors in shovel operations

Power alone is only half the story in shovel operations. ***Control*** is also a vital factor. And, with direct-current drives you get both high-torque power and instantaneous control for efficient, economical shovel operation.

"RIVER QUEEN," Bucyrus-Erie's giant 55-cubic yard strip shovel is an outstanding example of combined direct-current power and control in action. D-c equipped, the "Queen" is used for overburden stripping at the River Queen mine near Central City, Kentucky. This mine is owned jointly by Peabody Coal Co. and W. G. Duncan Coal Co. and is operated by Peabody.

POWER—The "River Queen's" dependable direct-current drives supply constant, stepless power to hoist, swing and crowd this giant machine efficiently and economically. This power is demonstrated daily in its open-strip mining operation. The shovel gouges out rock and earth in 80-ton bites, swings the load 295 feet, dumps it in 100-foot piles, and then returns for another 55-cubic yard bite. The duty cycle is repeated again and again, 24 hours a day, every day of the year.

ONE MAN CONTROLS the movements of this huge machine. The fast response and precise speed control enables the operator to make one complete duty cycle in less than a minute!

D-C DRIVES CAN HELP YOU increase tonnage mined and speed operating cycles in your shovel operations. And, the rugged construction of adjustable-voltage direct-current shovel drives means reduced downtime and a minimum of maintenance.

Direct Current Motor and Generator Department, General Electric Company, Erie, Pennsylvania. 811-6

Progress Is Our Most Important Product

GENERAL ELECTRIC

"MAKE the employee think safety, even at home. The last sign as you leave the plant is a reminder to take safety home with you"—Herman Justice, accountant.

What Safety Means

1. When a man is hurt, he and his family suffer financially, physically and mentally.

2. Industry is welcome in a community when that industry is a safe place to work.

3. All costs, including compensation and insurance, are lower for plants with good safety records.

National Safety Council calendars which stress safety each month are mailed to each employee's home. They make him think about safety, even at home. The last sign as you leave the plant is a reminder to take safety home with you.

Still trying to vary the theme and keep the safety program from going stale, Herman Justice, factory accountant, says that they are considering the purchase of a Polaroid Land camera to take on-the-spot pictures that will instantly show the man what he was doing that was unwise, unsafe or not in good housekeeping. To remind the man three days later that he should have been wearing a hat isn't as effective as handing him a photograph right then and there.

Training officially started in 1952, when a first aid training course was given for supervisors and foremen, and later for the labor force. About 80% of the employees took the course, but there was no accredited Red Cross instructor. Victor is starting the entire first aid program over again with three accredited Red Cross instructors trained at company expense. Now, all who complete the course will get a Red Cross certificate.

There is a large first aid room in the main office and an emergency room in the plant area. Small first aid room is used for classes. The program is under the direction of M. M. Neil, safety and personnel director.

Safety program calls for periodic talks by the foremen with each man in the plant. The foreman keeps a record of the talk and points discussed, and gets the employee's viewpoint. Report goes into each individual's personnel record.

Five-minute safety meetings are held on each shift, with the shift divided into two or three groups. National Safety Council programs are used at these meetings. These are preventive practices, dangers, hazards, demonstrations, etc.

Suggestions toward better safey are invited from employees. And each written suggestion is answered, in writing, as to its merits.

"Once you get a man interested in safe working conditions and practices, the rest is easy", Holtgrewe added.

A plant-wide safety meeting is held once a month, with a speaker coming in from outside the company. Sometimes, Victor says, they'll listen to a stranger when they won't listen to you. The stranger may be from an insurance company or from another plant. This meeting is not scheduled as a regular affair—again, to keep the program from becoming stale, routine.

Monthly supervisory meeting and dinner lasts about two hours, with one-third of the time devoted to safety matters.

Labor-management meetings are held occasionally to talk about the safety program and its progress. Victor holds these meetings at a time when someone from Victor's top management is available to sit in at them.

A union-management safety committee investigates all accidents and near-misses, and holds a monthly safety and housekeeping tour of the plant. Report is made to management with a follow-up report on the previous month's inspection.

Union members for this committee are selected by the company from union lists. One union member is changed each month, to give everybody a chance and to get everybody interested. Union members get a copy of the monthly accident and housekeeping report as well as all accident reports—keeps them thinking.

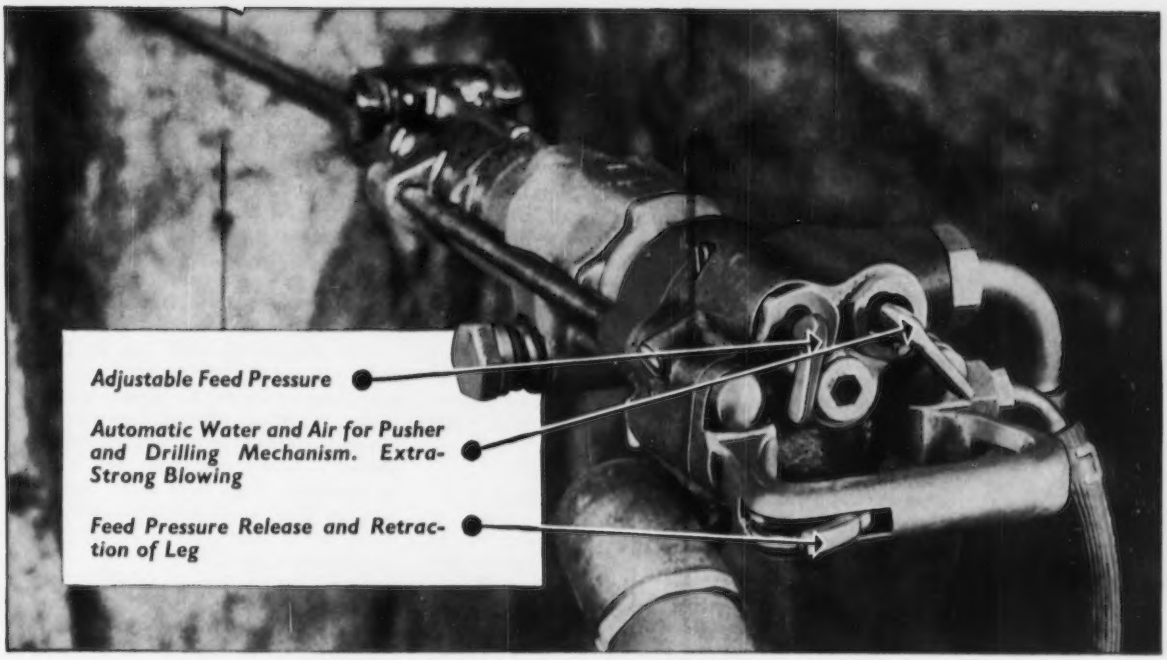
Housecleaning is the backbone of a good safety program. A rather elaborate fume and dust collecting system was installed and is still being improved.

An orange grove was established on the plant property as a check on the effectiveness of these measures. To keep the grove flourishing, the air pollution abatement equipment must be adequately maintained and efficiently operated.

Grass was planted around the plant to keep down the dust that caused so many foreign-particle-in-the-eye cases in the old days.

Victor holds a company-wide housekeeping contest each year in their seven plants. Tarpon Springs won it in 1954 and 1956—two out of the eight years it has been awarded. A management team shows up, unannounced, once a year and tours the plant. Each plant is reviewed, rated and a report made. Improvement in housekeeping counts just as much as cleanliness. When the final score is tallied, an annual award is given by Victor's president.

Why so much stress on housekeeping? Victor says that good housekeeping cuts accidents and that a clean, orderly plant frequently has a cost


Adjustable Feed Pressure
Automatic Water and Air for Pusher and Drilling Mechanism. Extra-Strong Blowing
Feed Pressure Release and Retraction of Leg

THE ATLAS COPCO LION— A REVOLUTIONARY NEW ROCK DRILL

All controls under one hand

The Atlas Copco Lion is the first drill to have all the valves which operate the drill under the control of one hand. *Full and easy control without having to move the hand from the backhead!* All the controls have been designed so that they are well protected. While using them the operator's hand is never near the wall or roof of the drift. The Lion is the first pusher leg drill with controls placed for drifting.

Retractable leg saves time

When the leg has to be moved the feed pressure is easily released by squeezing the hand grip. By further pressure on the grip the leg retracts automatically. When the leg is in the new position suitable for continuous drilling, retraction stops and the feed pressure comes back by loosening the grip of the hand. *All this can be done while the drill is still running.*

This new idea of a retractable leg enables quicker repositioning of the leg and reduces the number of steel changes, thereby increasing footage per manshift. When drilling high holes it is now far easier to alter the position of the leg more frequently in order to maintain an optimal feed angle and feed pressure.

Packed with power for deep holes

The Lion has a drilling rate at least 30% higher than other rock drills of the same weight. Furthermore, it can maintain its high speed *even when drilling deep holes.* This means quickly drilled deep hole rounds and a faster advance. The Lion also reduces *to a minimum* the gauge wear of the bits in abrasive rock. And owing to the ease with which the feed pressure is released and brought back into action, the Lion is a *handier* drill to work with in fissured rock.

Sandvik Coromant—the steel for the Lion

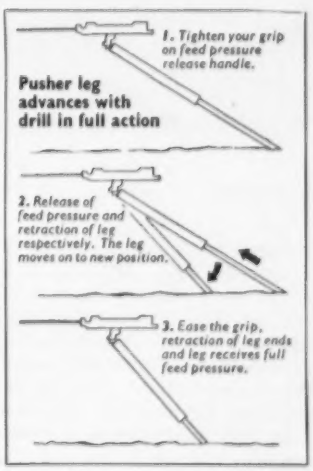
All Atlas Copco drills—and this goes for the Lion too—have been developed from the earliest stages with Sandvik Coromant tungsten-carbide-tipped integral steels and detachable bits. This combination pioneered tungsten carbide drilling in the early forties. No drill or steel developed separately could ever give such equivalently high performances as this drilling combination. Today it is the most widely used in the world, responsible for drilling more than 1,000 million feet annually.

For further information on the Atlas Copco Lion rock drill, and details of sales and service, please contact:

U.S.—Atlas Copco Pacific, Inc., 930 Brittan Avenue, San Carlos, California, or Atlas Copco Eastern Inc., P.O. Box 2568, Paterson 25, N.J.

CANADA—Atlas Copco Canada Limited, Montreal Airport, P.Q.

MEXICO—Atlas Copco Mexicana S.A., Apartado Postal 56, Torreon, Coahuila.


1. Tighten your grip on feed pressure release handle.
Pusher leg advances with drill in full action
2. Release of feed pressure and retraction of leg respectively. The leg moves on to new position.
3. Ease the grip, retraction of leg ends and leg receives full feed pressure.

Atlas Copco

D5674A

Manufacturers of Stationary and Portable Compressors, Rock-Drilling Equipment, Loaders, Pneumatic Tools and Paint-Spraying Equipment

advantage over an untidy competitor in the same cost region.

Community relations are handled by the superintendent and personnel manager. Complaints are gratifyingly few. In the rare cases where a complaint is heard—any complaint, even if it's obviously unjustified—it is given prompt and courteous attention. The superintendent or the personnel manager makes a personal call as quickly as possible on the complainant to let him know that the company is interested in being a good neighbor.

Is It Worth It?

In the beginning there were 80 to 90 foreign-particle-in-the-eye cases reported each month. Now eyes are still numerically the biggest item on the list, but nowhere near the figure for the pre-program days.

Phosphorus burns are almost unheard of now. Occasional cuts and bruises, burns from welding equipment and from working around the hot nodulizing kilns make up the rest of the first aid reports.

There hasn't been a lost-time accident for 1,491 consecutive working days.

Victor's compensation costs are down, both in State compensation cases and in insurance premiums. Present annual safety and first aid program costs are down considerably from the high of $10,000 in 1950.

Community relations are good.

In the table showing Victor's record over the years, note the high number of days charged for the fatality and loss of an eye. Florida State Compensation Act penalizes a company the actual number of days lost time due to an accident, then penalizes the company for severity of the accident. Not only does it cost money to have an accident, but the cost can run high for a bad accident—6,000 days for a fatality and 1,800 for loss of an eye.

Making Phosphorus

Elemental phosphorus is produced at Victor from low-grade pebble and concentrates purchased from Florida pebble phosphate producers. Phosphate material is dried in a nodulizing kiln to drive off the water and agglomerate the feed.

Agglomeration speeds up electric furnace production by keeping the charge loose. Heat for the kiln is provided by the waste heat and gases from the phosphorus furnaces. In addition to water, the heat also drives off some sulphur and fluorides. Kiln is 250 ft long and equipped with dust collecting and scrubbing system. Coke is dried with waste kiln heat.

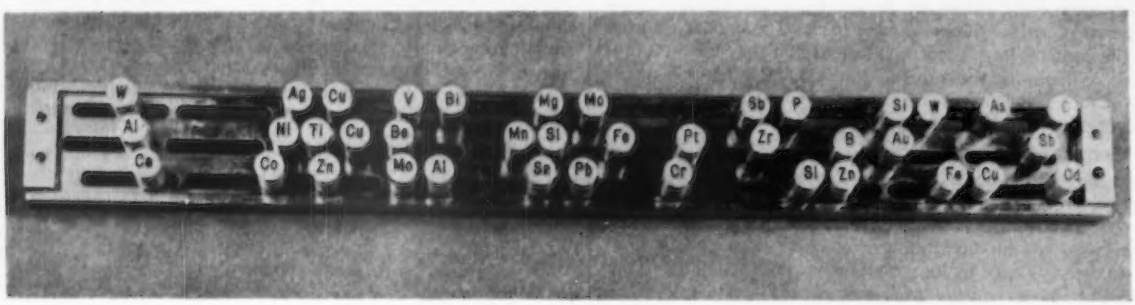
Fines in the kiln discharge are screened back to the kiln feed.

Agglomerate, silica and coke are stored separately, in silos. Each silo is analyzed and a burden sheet made up based on these analyses. Automatic scales weigh out proper amounts of each component as the furnace calls for fresh charge.

The phosphorus boils out of the charge in the electric furnace and is condensed at 50 deg C. Molten phosphorus is settled, filtered, then stored molten in tanks under water. Phosphorus is transferred into tank cars for shipment. Cars have three inches of water at all times and 13 inches of water in the dome. Water is used to cover molten phosphorus at all times, since the molten metalloid will react with air. The phosphorus solidifies in the tank car. Solid phosphorus will not react with air.

Slag tapped from the furnace is cooled with process water, then crushed, screened and sold to Florida Crushed Stone Co. Stone is hard to find in Florida, so Victor slag sells well.

Analyze For These Metals . . .



. . . Spectrographically, Automatically, Instantly

AUTOMATIC Spectro-Lecteur, developed by International Electronics Corp., Mineola, N. Y., can determine six elements in an alloy in less than one minute. Lecteur, called the first direct reading spectrograph, uses two photomultipliers instead of a photographic plate to measure spectrum emission lines. Photomultipliers eliminate integration. And the company reports that any number of elements can be posted on the program ruler shown above.

In the direct reading method, results are recorded automatically on a chart as the moving multiplier goes from station to station on the ruler. Lecteur operates as follows: prepared sample is mounted on the exciter and the start button pushed. The moving multiplier then goes from station to station as determined by the stop buttons on the ruler.

Spectrochemical analysis is based upon the intensity ratio of two spectrum lines: one line belonging to the spectrum of the basic metal in the alloy; and the other, to a spectrum of one element contained in the alloy. In the photographic analysis method, the value of the ratio of the one spectrum line to the other is obtained through measurement of the density of a photographic plate. In the direct reading method, however, this ratio is obtained through electrical measurement of potentials across the terminals of condensers loaded by the photomultipliers. Thus, in the Lecteur, one multiplier remains stationary, while the other scans individual lines to compare intensities.

Major advantages cited for the Lecteur over photospectrographic analysis are: emulsion errors are eliminated, and photomultipliers are more sensitive to both very intense and very weak spectrum lines.

Merle E. Hanson has operated other graders, and he says:

"THE NO. 12 HAS ALWAYS BEEN MY FAVORITE MACHINE"

This Caterpillar No. 12 Motor Grader maintains two miles of 40-foot haul road at an open pit copper mine near Butte, Montana. On the job 8 to 16 hours per day, 6 days a week, this hard-working machine has the enthusiastic approval of its operator, Merle E. Hanson.

"The No. 12 has always been my favorite machine," he says. "I've operated other makes of graders and have had a chance to compare. The No. 12 has good visibility and is easy to handle. It has always taken less adjustment and less repairs than any other machine."

Other Caterpillar-built machines are also on this Anaconda Company operation. Four D8 Tractors and two D6 Tractors are removing overburden and copper ore. The F & S Contracting Co. of Butte, and the Morrison-Knudsen Co. of Boise, Idaho, have a joint contract from The Anaconda Company to do a limited amount of work on this ore body.

Already known as the "standard of the industry," the No. 12 has pulled even further ahead of the field with its *exclusive* new Preco Automatic Blade Leveler, which makes it possible to control slopes within ⅛" in 10′ width. Other important features of the No. 12: powerful CAT* Diesel Engine; long radius, curved side shift rack that allows a full range of blade positions without changing links or adjusting the blade; tubeless tires—which reduce tire down time as much as 80%; and long-life oil clutch.

In addition to the No. 12, there are two other motor graders in the Caterpillar line: the No. 112 and the No. 212. Let your Caterpillar Dealer demonstrate the one best suited to *your* needs on *your* operation. You can count on him for expert, reliable service—and parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

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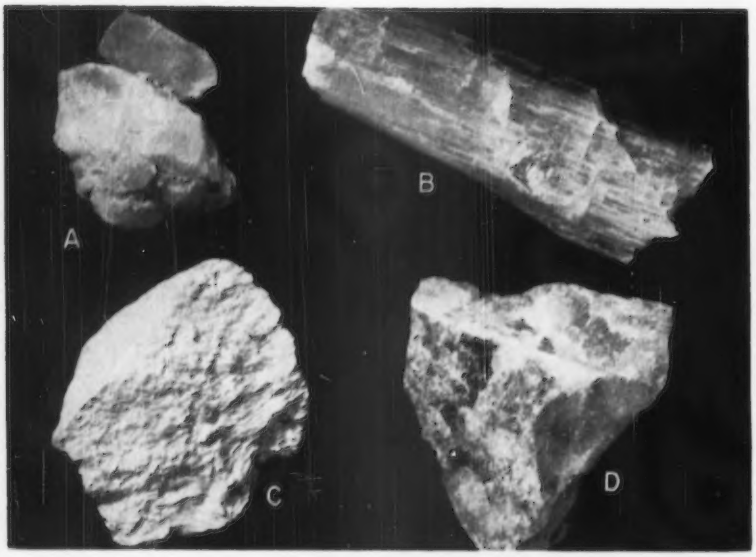
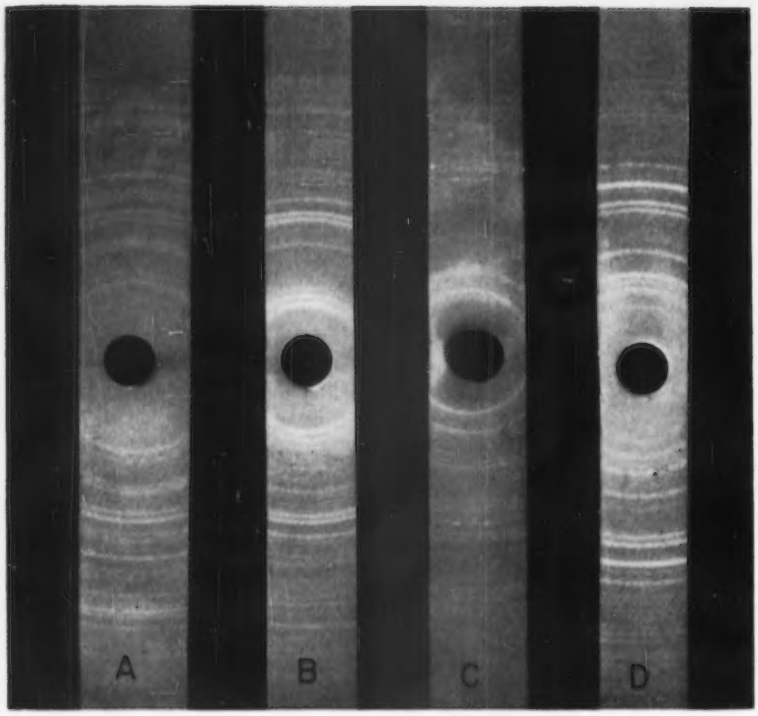
WANTED—
THE HARD WORK

X-Ray Is Key Tool In PCB Laboratory

VERN W. PALEN





BORATE MINERALS (a, **colemanite;** b, **kernite;** c, **ulexite;** d, **tincal**) and their corresponding powder diffraction photographs. By comparing the intensity and position of the diffraction bands to standardized charts (each mineral produces an unchanging and characteristic pattern), laboratory scientists can easily identify the unknown specimens.

PACIFIC COAST BORAX CO. scientists are now making daily use of X-ray techniques to solve problems involving new product developments and quality control. Researchers at the company's laboratory perform the tests in the following manner: (1) mineral specimen is placed in the center of a circular chamber around which a film strip has been wound, (2) X-rays are shot through a hole in both chamber wall and film strip, (3) beams hitting the specimen are diffracted and recorded on the film, and (4) film strip is removed to compare the intensity and position of mineral's diffraction pattern with standardized charts (each mineral or element produces an unchanging and characteristic pattern).

Much of the ore to be tested comes from the company mines at Boron, Calif., and, in numerous cases, X-ray analyses indicate the finding of a new mineral. Magnesium borate, previously found only at Inder, Kazakstan, Russia, was mined at Boron and detected in this manner.

Lab scientists also solve problems that originate with company customers. One such case involved fiber board walls that were coated with fireproof paint, which, after a period of time, became fuzzy in appearance. When checked by X-rays, paint was found to contain boric acid formed by unanticipated chemical action. Problem was eliminated by altering the paint formula.

X-ray film diffraction is by no means the only method of microscopically analyzing chemical elements and compounds. Of vast importance are the X-ray diffractometer and X-ray spectrographic systems.

Diffractometer operation consists of X-rays being bounced off a specimen, resulting in diffracted rays which are then detected by a geiger counter and finally recorded as hill-and-valley curves on a strip chart.

Spectrograph procedure is similar to the diffractometer method except that X-rays are "screened" by an analyzing crystal (acting as a diffraction grating) before they reach the geiger counter.

Although gaining element and mineral information of entirely different sorts (diffractometer—atomic structure of the compounds in question; spectrograph—elements present in a substance), these last two types of X-ray analyses furnish results that are as accurate and constant as those gained by the diffraction photo method.

*Mr. Palen is a member of Philips Electronics, Inc., Instrument Division, Mount Vernon, N.Y.

NOW...DRILL 9" HOLES WITH THE NEW JOY 59-BH CHAMPION

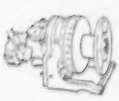
This world-famous pioneer rotary-air-blast-drill has adopted many of the features of its big brother, the Super-Heavyweight, to give you these advantages:

MORE STABLE DRILL STRING through use of round pipe . . . BETTER AIR CIRCULATION and cuttings removal . . . FASTER DRILLING—faster retraction of hydraulic feed averages total of only 3 minutes on a 51′ hole . . . EXTENDED 55′ MAST permits drilling 50′ hole without adding pipe . . . BETTER MOBILITY —hydraulically raised and lowered mast is left assembled during long moves . . . 9" HOLE allows wider hole spacing, economical use of large diameter powder.

This all adds up to new records in low cost per ton of rock. Get the whole story on the 59-BH. Write to ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.

Write for Bulletin 168-4

JOY . . . EQUIPMENT FOR MINING . . . QUARRYING . . . CONSTRUCTION



WSW M 6565-168

PORTABLE AND SEMI-PORTABLE AIR COMPRESSORS • ROCK DRILLS • WAGON DRILLS • DRILL BITS • BACKFILL TAMPERS • SPADERS
PAVING BREAKERS • SHEETING DRIVERS • DRIFTERS • PORTABLE HOISTS • FANS AND BLOWERS • PORTABLE SAFETY LIGHTING

Out of the pit with 18-tons of shovel-loaded limestone comes the "65" Payhauler owned by Lee Crawford Quarry Co., Cedar Rapids, Iowa. The 1,200-foot haul includes a 400-foot 15% grade. The "65" was chosen on competitive demonstration.

"65" Payhauler® beats two competitors on tough, 50-hour demonstration

—for Lee Crawford Quarry Co., Cedar Rapids, Iowa

Veteran quarryman Lee Crawford invited three makes of off-highway haulers to go into his pit and "roll up their sleeves." He wanted hauling that could match the crushing efficiency of his newly-equipped plant which is as nearly perfect as could be built.

One make of hauler could not match crusher capacity. Another kept the monkey wrenches busy. Winner of the 50-hour test: the International "65" Payhauler!

"Perfect Payhauler performance made our choice easy," states Plant Superintendent Kenneth Mercer. "The '65' hauled bigger loads easily up the 15% grade out of the pit. It dumped cleaner, and up to three times faster—and got away faster for shortest cycle time.

"With the '65' we have achieved our plant efficiency goal."

Try the exclusive high reverse and "zip-around" power steering—that give 18-ton "65" or 24-ton "95" regular pick-up truck spotting ease. Measure capacity-adding Payhauler get-away speed—and the fuel economy of its load-matched, turbo-charged diesel power. Measure super-fast Payhauler dumping speed. See your International Construction Equipment Distributor for a demonstration!

INTERNATIONAL® CONSTRUCTION EQUIPMENT

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

International Harvester Company
180 North Michigan Ave.
Chicago 1, Illinois

Gentlemen: Please send me a free copy of the new, fully-illustrated Payhauler catalog (Form CR-603-G).

Name_____

Street Address_____

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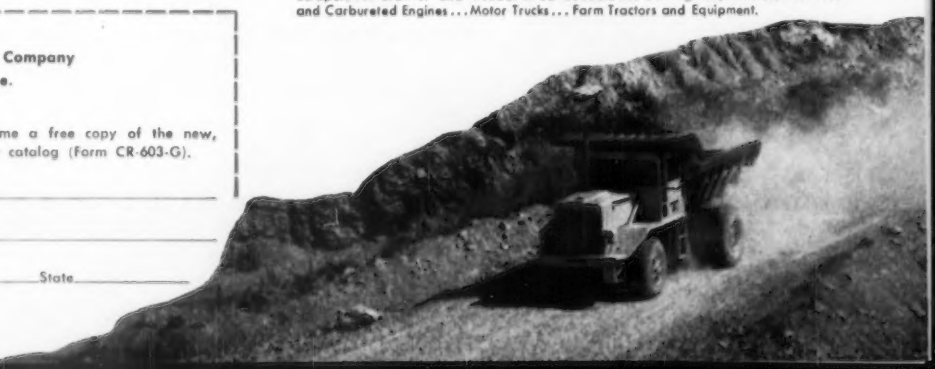

PERSONALS *(Continued)*

PERSONALS

Magee

Wilson

At a board meeting on Sept. 19, Aluminum Co. of America's directors elected **I. W. Wilson** chairman of the board, and **Frank L. Magee** president. As chairman Mr. Wilson succeeds **Arthur Vining Davis,** who retired Aug. 2. Mr. Wilson, president since 1951, will continue to serve as chief executive officer. Mr. Magee, the new president, has been with Alcoa since 1917, following his graduation from Lehigh University. After World War I, he returned to Alcoa, holding sales managerial posts in New York and Georgia before going to Pittsburgh in 1937. Elected a vice president in 1946, he became a director three years later. In 1955 he was named executive vice president, and is an officer and director of several Alcoa subsidiaries. Also elected at the Pittsburgh meeting were: **Harold C. Erskine,** as a vice president, and three new directors: **M. M. Anderson,** vice president-personnel and industrial relations; **Ralph V. Davies,** vice president and general sales manager, and **George W. Wyckoff**, vice president of T. Mellon & Sons, Pittsburgh.

Oliver C. Ralston, chief metallurgist of the U. S. Bureau of Mines since 1949, retired recently after serving with the Bureau since 1912, except for two periods in private industry. After graduation from Colorado College with a B. S. degree, he worked on coal chemistry for two years; he was then assigned to metallurgical research, a field in which he was engaged until his retirement. He had served under every director of the Bureau and was largely responsible for development of the Bureau's metallurgical program from a single station at Salt Lake City, Utah, which he helped establish in 1914, to its present position of international prestige.

William A. Griffith, formerly with New Jersey Zinc Co., Bertha Mineral division, Austinville, Va., has joined Rare Metals Corp. of America, Tuba City, Ariz. as metallurgist.

Meridan Iron Co. of Minneapolis, Minn. has appointed **C. W. Aronson** vice president; **James R. Stewart,** formerly chief engineer, will succeed Mr. Aronson as general manager; **Peter F. Torreano,** assistant superintendent of Pickands Mather & Co.'s Peterson mine, succeeds Stewart.

Charles S. Beidleman, Coleraine, Minn., was appointed general pit foreman of the King iron mine, Oliver Iron Mining division on the Mesabi range.

Admiral Arthur W. Radford, formerly chairman of the Joint Chiefs of Staff, has been elected a member of the board of directors of Molybdenum Corporation of America, as of Sept. 27, and has joined the executive staff as consultant. Admiral Radford will make his New York office at the corporation's executive offices.

Samuel A. Scott, formerly project engineer for Colorado School of Mines Research Foundation, Golden, Colo., has joined International Minerals & Chemical Corp., Chicago, as a mining engineer. Scott, a graduate of University of British Columbia in 1949, is a native of Canada.

Franklin Institute's Francis J. Clamer Medal was awarded Oct. 16, to **William G. Pfann,** metallurgist with Bell Telephone Laboratories, Murray Hill, N. J., in recognition of his discovery and application of zone refining to metals and other crystalline substances.

Dr. Edgar C. Bain, assistant executive vice president-operations, United States Steel Corp., has retired after nearly 30 years of service. In 1928 Dr. Bain began his career with U.S. Steel as head of the metallurgical department of the newly formed Research Laboratory at Kearny, N.J.; in 1935 he became assistant to vice president; in 1943 vice president-research and technology of Carnegie-Illinois Steel Corp. as well as chairman of the Research Policy Committee. He assumed his present duties on July 1, 1956. Among the many awards he has received are AIME's Robert W. Hunt Medal for work in the field of iron-chromium-nickel alloys, the Henry Marion Howe Medal of American Society for Steel Treating for studies on grain structure of martensite, and the Gold Medal for metallurgical research, ASM's highest honor. A new constituent in steel is named "Bainite" in honor of its discoverer. One of the major buildings of U. S. Steel's Research Center in Monroeville, Pa., is named the Edgar C. Bain Laboratory of Fundamental Research.

Bain

Dr. A. Raymond Jordan, formerly of the Denver Research Institute, was appointed Dean of Colorado School of Mines' graduate school, as of Oct. 1.

Malcolm Ian Ritchie was named superintendent of Lucky Mc Uranium Corp.'s mill now being built in the Gas Hills of central Wyoming. For the past 15 months he worked in the Blind River uranium fields with Rio Tinto Mining & Development Co. and for the preceding five years in the South African gold and uranium fields.

James Edmunds, who was chief engineer with Potash Co. of America Ltd., Saskatoon, Sask., is now with Western-Knapp Engineering Co. in San Francisco, as chief mining engineer.

James A. Barr, consulting engineer, and Mrs. Barr of Mt. Pleasant, Tenn., left on Sept. 19 for Rome, Italy on a minerals economic mission for the World Bank. Headquarters were in Rome with trips to Sicily before their scheduled return to the U. S. in October.

Philippine Gold Producers Association elected **A. L. Valilla,** executive vice president of Marsman & Co., as president, to succeed **Henry A. Brimo.** Other officers include: **John C. Bardey** of Benguet Consolidated, **Eric J. Sanders** of Balatoc, and **Otto Weber** of Surigao Consolidated.

Carl B. Jacobs, formerly vice president of Caland Ore Co., Ltd., Inland Steel Co. subsidiary, is the company's new president. **Ray D. Satterley,** of Ishpeming, Mich., formerly manager of iron mines, was elected vice president and general manager of the company's ore mines. **Philip D. Pearson,** manager of Caland, was elected a director.

A. J. Cayia, manager of Inland Lime & Stone Co., subsidiary of Inland Steel Co., retired Aug. 1. Engaged in mining since 1914, he joined Inland's limestone division in 1928, and has been president of Caland Ore Co., Ltd., Inland's subsidiary which operates property leased from Steep Rock iron mines. **A. W. Heitman,** of Manistique, succeeds Mr. Cayia as Inland Lime & Stone's president. **John Moffat,** superintendent, succeeds Mr. Heitman and is now also a director. **Howard M. Graff,** of Ishpeming, Mich. was made manager of ore mines.

Philip D. Wilson, consulting mining engineer and geologist, has been elected a vice president of Callahan Zinc-Lead Co.

Adrian C. Dorenfeld, well known to *E&MJ* readers, has joined Roberts and Associates, mine consultants on exploration, development and operation, at 639 So. Spring St., Los Angeles 14, Calif. Formerly assistant professor of mineral engineering at University of Alabama's School of Mines, Mr. Dorenfeld has contributed over the past several years articles on application of theory to practice, among which "How to Use Quality Control to Improve Mill Production," appearing in *E&MJ*, July 1951, was especially popular and well received. Other topics include slime coating, factorial design testing of new flotation reagents, and improvement in mineral industry test procedures.

Dorenfeld

PERSONALS *(Continued)*

Royce A. Hardy Jr., of Henderson, Nev., has been named assistant secretary of the Interior for Mineral Resources, to replace **Felix Wormser** who resigned June 15. Hardy, general manager of Manganese Inc. of Henderson since 1956, and previously general superintendent of Getchell mine in Humboldt County, Nev. for 10 years, will now supervise the programs of the Bureau of Mines, the Geological Survey, Office of Oil and Gas, the DMEA, Office of Minerals Mobilization and the Division of Geography.

Denison Kitchel, Phoenix attorney, and **Kenneth C. Kellar,** counsel for Homestake Mining Co., of Lead (DMEA) S.D., have been appointed by Secretary of Labor Mitchell as the American delegates representing employers to a meeting in Geneva of International Labor Organization's Committee on Mines Other Than Coal Mines. Nominations were made at a meeting of the AMC board of directors in Salt Lake City, Sept. 10. The Geneva, Switz. meeting will take place November 25-December 7.

Dr. David W. Mitchell, who for 12 years was associate professor of metallurgy at University of California, has joined Foote Mineral Co. of Philadelphia as manager of minerals research at the company's research laboratories in Kings Mountain, N. C., where lithium production operations are under way.

W. Page Morris is Duval Sulphur & Potash Co.'s new president, elected to succeed the late **George F. Zoffman.** Prior to his association in 1950 with Duval Sulphur, Mr. Morris had been with International Minerals & Chemical Corp. and United States Potash Co.

Appointed executive officer of the Defense Minerals Exploration Administration's field team in Region III, **William H. King,** Denver mining engineer, will direct DMEA's operations in eight states. **J. F. Shaw,** also a mining engineer, is now acting superintendent, serving in King's former capacity as superintendent of the Denver Experiment station.

Elected a director of National Lead Co., **J. Paul Kirk,** president and a director of Morris P. Kirk & Son, Inc., a National Lead subsidiary with operations on the West Coast, is also president and a director of Pioneer Aluminum, Inc. of Los Angeles. His headquarters will remain in Los Angeles. He attended the University of California's College of Mining, and was a founder of Morris P. Kirk & Son, Inc. in 1922. Mr. Kirk now succeeds **H. T. Warshow,** who has retired after 36 years of service with the company. Mr. Warshow was also a vice president of National Lead.

Kirk

H. C. Koch, manager and board member of Anglo American Corp. of South Africa, Ltd. was elected president of the Transvaal and Orange Free State Chamber of Mines. On the Chamber's Executive Committee since July 1948, Mr. Koch has also been a member of the Gold Producers' Committee since September 1952, and is chairman of gold mining and uranium producing companies of the Anglo American group.

Kennecott Copper Corp. has appointed **Scott L. Burrill** as concentrator general foreman in charge of the company's plant at McGill. Burrill was previously concentrator general shift foreman.

Dr. Alexander Silverman, world famous authority on chemistry of glass, has been retained as a special consultant to Foote Mineral Co. to assist in its research into the use of lithium in inorganic chemistry and glass technology.

Charles E. Schwab has been appointed to the newly created position of assistant to the president of Bunker Hill Co. in San Francisco. Mr. Schwab was formerly manager of employee and public relations of the company's Kellogg, Idaho operation. He has been chairman of the industry's Emergency Lead-zinc Committee since it was organized in June and will be in Washington up to mid-November before taking up the duties of his new position. Prior to joining Bunker Hill in 1944, he worked as an exploration engineer for Basic, Inc. of Cleveland. **B. F. Mahoney,** assistant manager of employee and public relations division, succeeds Mr. Schwab in his old post.

Schwab

Two new assignments were announced by M. A. Hanna Co. recently, appointing **E. W. Geist** general superintendent of open pit mines for the Iron River, Mich. district, and **F. H. Lee** superintendent of Groveland pilot plant property, near Randville, Mich.

By action of the Board of Regents of University of Minnesota on June 15, 1957, Minnesota School of Mines and Metallurgy has been reorganized and now comprises three divisions: Mineral Engineering, Metallurgical Engineering, and Mines Experiment Station. The chiefs are, respectively, **Profs. E. P. Pfleider; S. R. B. Cooke,** who is also Head of the School; and **H. H. Wade,** appointed director recently of the Experiment Station. Physical Metallurgy has been transferred to the School of Chemistry where it will function as Department of Metallurgy under **Prof. M. E. Nicholson.** Separate curricula are now available in Metallurgical Engineering, Geological Engineering, Mining Engineering and Geophysics (School of Mines and Metallurgy), and in Metallurgy (School of Chemistry).

Battelle Memorial Institute's Corrosion Research division now has as its new chief, **Frederick W. Fink.** Since first joining the staff in 1938, Mr. Fink has specialized in corrosion studies, particularly those related to nonferrous metals and stainless steels, and has had published the results of his studies covering such diverse corrosion problems as the attack of magnesium by marine environment, fretting corrosion, metallic corrosion by flue gas condensates, and corrosion in oil-well equipment. Recently he headed the National Association of Corrosion Engineers' Technical Practices Committee T-3 on General Corrosion Problems; currently he is serving as chairman of the education symposium to take place in San Francisco at NACE's annual meeting. He is also affiliated with AIME.

Fink

Walter J. Nock has been appointed assistant general manager of Mexican Mining department at El Paso. Since 1928 he served at many of the mining units in Mexico before going to the El Paso office of American Smelting & Refining Co. as assistant manager in 1953. **A. F. Horle,** formerly chief engineer, replaces Mr. Nock; **W. D. Baker,** assistant superintendent at the Parral Unit, has been named acting superintendent of the unit. **W. R. Landwehr,** chief geologist of Western Mining department, has been made its acting manager at Salt Lake City.

W. T. Robson has been appointed general manager of Lake Shores Mines Ltd. A member of the Canadian Institute of Mining and Metallurgy, Mr. Robson was a recipient in 1937 of the Barlow Memorial Prize for his paper on "Lake Shore Geology."

Frederick C. Jaccard, who at one time supervised installation of many of Butte's electric mine hoists, directed some of the preliminary work on Anaconda's famed Big Stack, and who was in charge of construction of the zinc plant at Great Falls, retired after more than 40 years of service with The Anaconda Co.

A. P. Morris, general manager, Ray Mines division, was re-elected to American Mining Congress' western division board of governors at the AMC convention in Salt Lake City, Sept. 11. **T. A. Snedden,** southwestern manager of Asarco at Tucson, was also elected as an Arizona board member to succeed **Walter C. Lawson,** Phelps Dodge Corp.

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PERSONALS *(Continued)*

Elected a vice president, **Wilbur L. Kennicott** became associated with Kennametal Inc. 18 years ago, a year after it was founded. He served as a sales representative in Texas and California for three years, and in 1941 was assigned to the firm's headquarters in Latrobe, Pa. where he has since headed the company's engineering activities. Holder of a metallurgical degree from University of Utah, he has served on technical committees of ASME, ASTE and American Ordnance Association. Mr. Kennicott has pioneered new techniques in use of tungsten carbide in metalworking industry and is holder of several patents on such developments.

Kennicott

Officers elected at Aug. 28 meeting of the Mining Sub-Section of the Upper Peninsula of Michigan Section of AIME, held in Ishpeming, Mich., were: **Walfrid Been,** of Houghton, Mich., head of mining department at Michigan College of Mining & Technology, as subsection chairman; **Arthur Martini,** superintendent, Pickands Mather & Co., Caspian, Mich., as vice chairman; **John Wangaard,** of Ironwood, superintendent, PM&Co's Peterson and Cary iron mines on the Gogebic iron range, as the new secretary-treasurer.

William J. Daly, presently mill superintendent of Can-Met Explorations Ltd., has been, in addition, appointed assistant mine manager.

ERRATUM—Last month Dr. Howard L. Hartman was incorrectly identified as professor and head of the department of mining at the Colorado School of Mines. Dr. Hartman holds the post at Pennsylvania State University.

OBITUARIES

George O. Argall, 78, widely known Colorado mining engineer, died Oct. 17 at his Denver home. Mr. Argall received his mining degree from Columbia University. He lived at Leadville, Colo., from 1906 to 1932, during which period he served as manager, at different times, for Iron Silver Mining Co., Mt. Elbert Gold Dredging Co., Leadville Zinc Lead Co., and Leadville Deep Mines Co. After 1932 he maintained a mining consulting office in Denver, serving clients throughout the U. S., Canada and Mexico. He held memberships in Mining & Metallurgical Society, IMM, AIME, Colorado Scientific Society and Colorado Mining Association.

Roy B. Johns, 64, vice president and sales manager, Freeport Sulphur Co., died July 24, in New York City. Mr. Johns first joined Freeport in 1915 at the Freeport, Tex. sulphur property, and became superintendent of marine and loading activities; in 1930 he became assistant vice president and sales manager. In recent decades he played a prominent role in developing new uses and markets for sulphur.

Jeremiah D. Murphy, assistant secretary, The Anaconda Co., died suddenly on Sept. 19, at Butte, Mont. Mr. Murphy, a native of Butte, was 69 years old. He began his career with the company as an office boy 52 years ago. "J. D." or Jerry, as he was affectionately known to hundreds of friends and associates he had in Butte and other cities of Montana and in the mining industry generally, was a most popular and highly respected figure throughout his lifetime. He was active in civic and church affairs in Butte where he had received his formal education, and which he completed in night classes at Butte Business College while working as an office boy. Promoted to clerk and assistant to the company's land and tax department in 1909, Mr. Murphy advanced to the vice president's office as a secretary in 1914. Since the early 1930's he had been private secretary to men who served as Western vice presidents of the company and also assistant secretary of the company. He was one who closely followed all trends and developments in the mining industry and possessed an unusual amount of information regarding the history of The Anaconda Co., as well as of Butte.

Edward Carl Joachim Meyer, 77, a well known personality on the Witwatersrand goldfield of his day, died on his farm in the Middleburg (Transvaal) district July 13.

Samuel Beaton, 80, one of the best-known mine managers for years on the Rand, died Aug. 1 at White River, Eastern Transvaal.

Fred B. Hyder, a distinguished alumnus of Colorado School of Mines of the class of 1903, died June 14, in Van Nuys, Calif. Mr. Hyder's career covered almost the entire field of his profession as engineer. His career in Alaska was particularly distinguished and resulted in having the mining town of Hyder named for him.

Theodore W. Becker, 37, a geologist for Mining Division of Union Pacific Railroad, was killed in a helicopter crash at Rawlins, Wyo., Aug. 16, 1957. A first lieutenant in the Air Corps, he served in the European Theater of Operations. After graduation from Michigan College of Mining and Technology in 1949 with the degrees of mining engineer and geological engineer, he was with Combined Metals Reduction Co., Nev. for four months, and with American Zinc, Lead & Smelting Co. at Metaline Falls, Wash. until 1955. Prior to joining Union Pacific, he had been with Loma Uranium Corp., Denver, Colo. as a geologist.

John W. (Jack) Thompson, 82, widely known developer of modern ore milling processes, died in Salt Lake City, Sept. 22, of a heart ailment. Graduate of University of Nevada School of Mines, class of 1898, Mr. Thompson, in semi-retirement in recent years, was in demand as a consultant milling engineer. A native of Plumas County, Calif., he moved to Utah in 1899 and aided in design and construction of a 25-ton sampling mill for Silver King Mining Co., Park City. In 1901, he was superintendent and later manager of Checkmate Gold-Silver Mine, Pearl, Idaho, and from 1906-1913, assistant superintendent of Kearns-Keith property, Park City, Utah. Mr. Thompson joined with F. E. Marcy of Mine & Smelting Supply Co., in 1913, in development of an experimental ball mill for Utah Copper, and after a stint with Rio Tinto Copper Mine in Spain, he organized a mines engineering partnership with Lionel E. Booth in Salt Lake City. Together they developed and marketed an "Agitair" flotation machine and built several mills. Prior to his retirement he held the post of vice president in charge of field operatons at Galigher Co.

Thompson

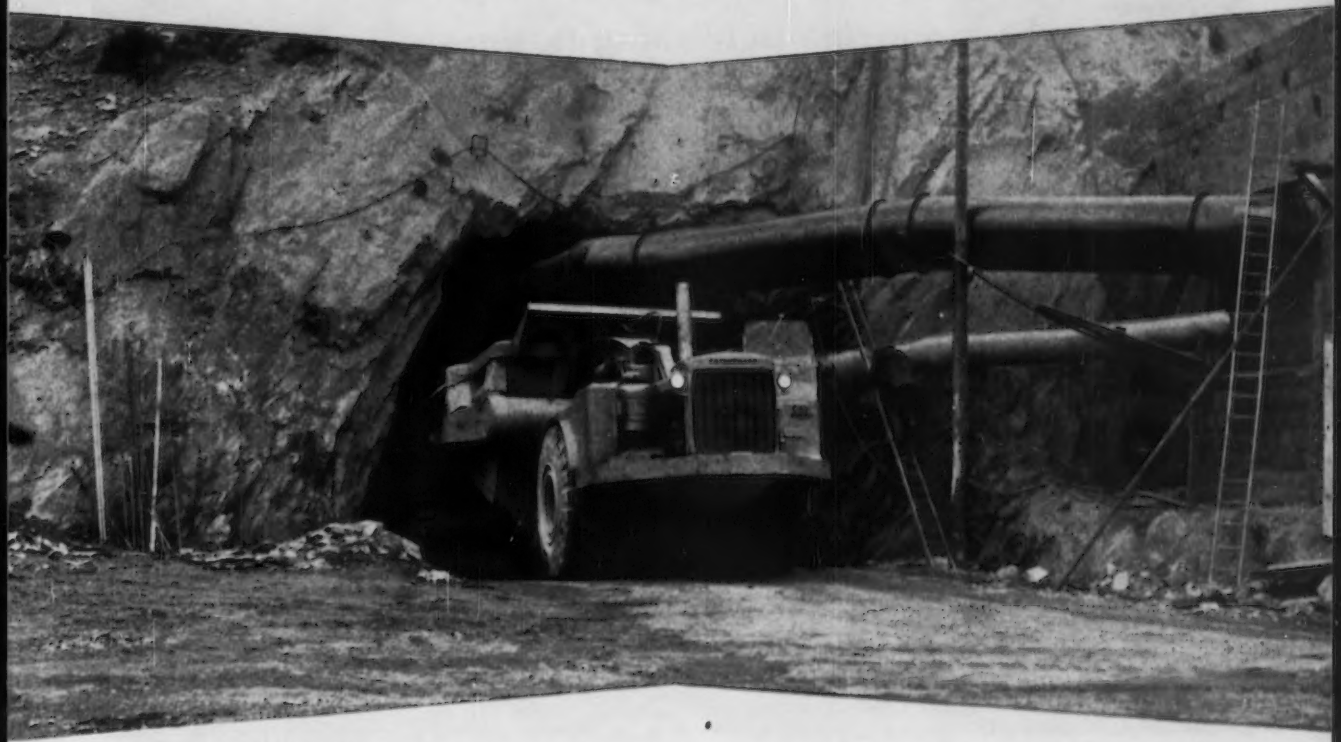
Walter Bradshaw, 84, died in a Butte, Mont. hospital Sept. 29. Known as "the last of the hardrock drilling champions," Mr. Bradshaw and a partner, Joe Freethy, set a world hammer and drill record in 1901, boring 55 inches into a concrete slab in 15 minutes. He worked as a miner until mechanical apparatus supplanted the hammer and drill.

Alan Cockeram, 62, well known in Canadian mining, as well as political and military circles, died suddenly in New York, in early September. He had been on the way to Peru in connection with the affairs of Peruvian Oils and Minerals, of which he was president, when he was stricken.

John Hunt, 54, vice president in charge of projects for Falconbridge Nickel Mines, died at his home in Toronto during the week of October 3. A native of Scotland, Mr. Hunt came to Canada in 1927. He was with Vickers Ltd. and Aluminum Co. of Canada before joining Falconbridge in 1932, transferring to the head office in 1947. He had been appointed vice president of projects this year.

M. F. Tynan, 59, assistant general manager, Mexican Mining department of Asarco, died suddenly July 8, in El Paso. With the company since 1925, he was superintendent of the San Pedro Unit from 1932 to 1950, at which time he assumed the post of assistant general manager.

HOW ST. PATRICK'S COPPER MINE MOVES 1⅓ MILLION TONS OF ROCK A YEAR



ON ITS WAY OUT OF THIS MINE, a huge Caterpillar DW21 Wheel Tractor stops to have its picture taken—for here it is helping to make mining history.

At St. Patrick's Mine near the village of Avoca in County Wicklow, Ireland, four 30-ton units are operating *underground*—first machines of their size ever to do so, anywhere in the world.

The machines are CAT* DW21s (Series C). They're hauling earth and rock from inside the mine tunnel to an outside dumping area. The tunnel is 17 ft. high, 16 ft. wide, and when it is finished it will run 8,000 ft. at an 11% slope. In and out of this tunnel roll the mighty DW21s, each hauling an Athey PR21 rubber-tired rear dump trailer with 34-ton load.

When the haulage-way is completed, St. Patrick's will work three ore bodies—which are at different levels—in one 20-year program. 1⅓ million tons of rock will come out of the ground here each year, on the fast-moving wheels of St. Patrick's 300 HP (maximum output) Caterpillar DW21 Wheel Tractors.

How are the DW21s doing on this history-making assignment? "They are easy to handle," reports transport foreman Phelim Doyle. "I would like to have ten more." Operator Thomas Doyle agrees: "It's easy to steer, and it has plenty of power."

Your Caterpillar Dealer will give you complete information on this remarkable unit. For example, special exhaust scrubbers are available for the DW21's engine for underground work. Ask him about its performance on any kind of stripping or hauling job. Call on him, too, for expert service—and for replacement parts you can trust.

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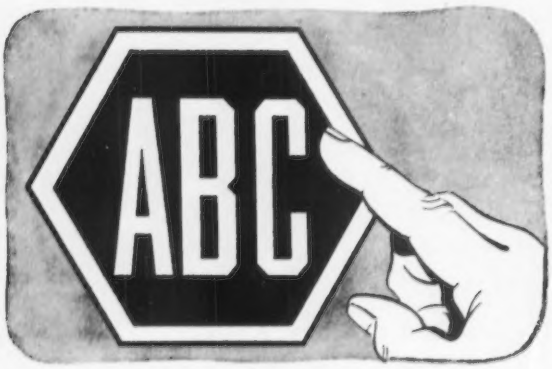

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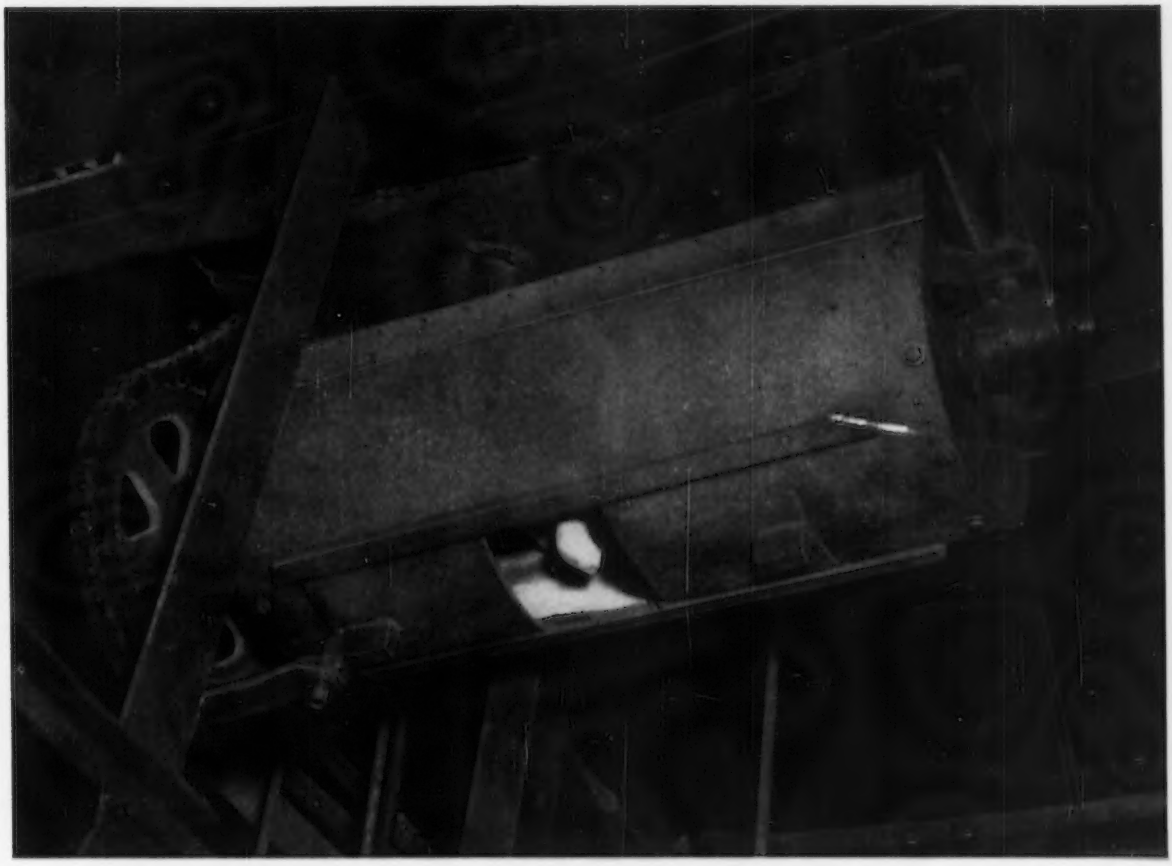

LOCK JOINT PIPE COMPANY of NEWINGTON, CONN., REPORTS:

6 times longer service life with JALLOY steel plate

Mild steel plate at bottom of this cement agitator had to be replaced every 4 weeks. The ¼" Jalloy plate, now used, lasts from 22 to 24 weeks. The Lock Joint Pipe Company has a resultant saving in reduced downtime and steel cost.

Heat treated Jalloy steel will also extend the life of your products that are subjected to rigorous impact and abrasive conditions. Increased product life can reduce your downtime and maintenance costs. Jalloy is available in forms you require (hot rolled sheets, plates, bars, small shapes and structurals). It can be purchased in three different grades to meet requirements of formability, hardness and wear resistance.

Your local distributor can supply you with details on Jalloy grades, or you can write to Jones & Laughlin Steel Corporation, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

This Jalloy plate is formed cold into a half circle 14 inches across the open end. Length of the agitator bottom plate is 30 inches. Dick Griffith, superintendent at the Newington, Conn., plant, reports that Jalloy steel plate stands up under the tough abrasive action of the cement dry mix and the pounding of the 16 agitator teeth. Material for this installation is supplied by Brown-Wales Co., Cambridge, Mass.

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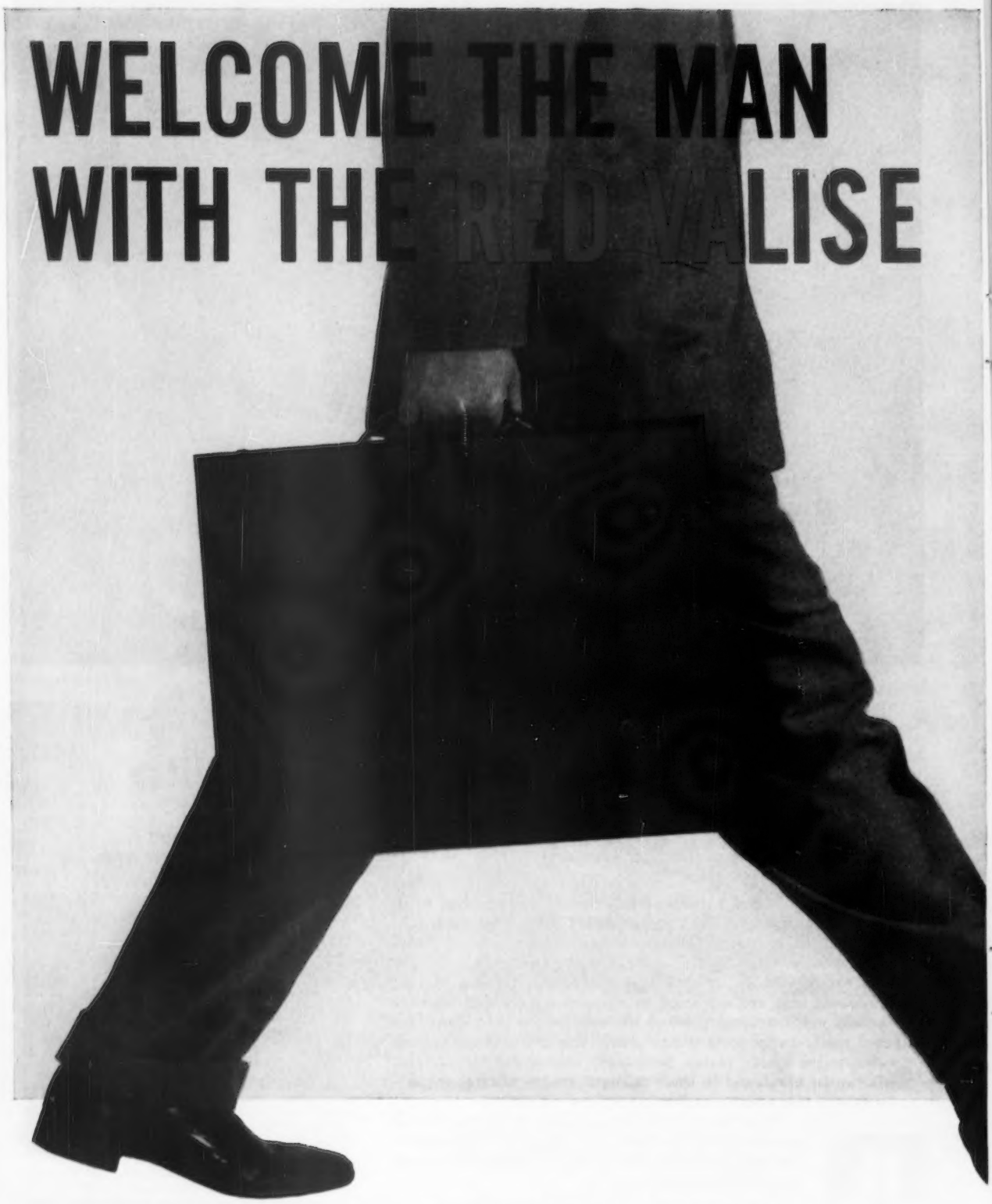

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Whatever you need in a blasting cap, Hercules has it—And the Hercules representative can show you an actual dummy sample from this "full line" kit. The Man with the Red Valise will be calling on you soon—if he hasn't already—and when he does you'll learn why Hercules is a recognized leader in blasting cap development.

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Electric Blasting Caps—Manufactured in two strengths with plastic-coated copper leg wires available in lengths from 4 to 250 feet.

Waterproof Electric Blasting Caps—Designed to withstand high water pressure.

No Vent® Delay Caps—One-piece, all-metal shell. No Vent helps prevent misfire in wet work. Available in delay periods from "0" to "15". An exclusive Hercules development.

No Vent® Short-Period Delay—Similar in construction to No Vent cap but in 27 delay periods from 25 milliseconds to 2950 milliseconds.

Electric Squibs—Special firing devices for use with black blasting or pellet powder where electricity is employed.

Special Packings—All-electric blasting caps may be obtained packed on cardboard spools for easier handling. Primatube®, a rigid cardboard tube available for some types of caps, makes a primer when the tube is fitted over a dynamite cartridge.

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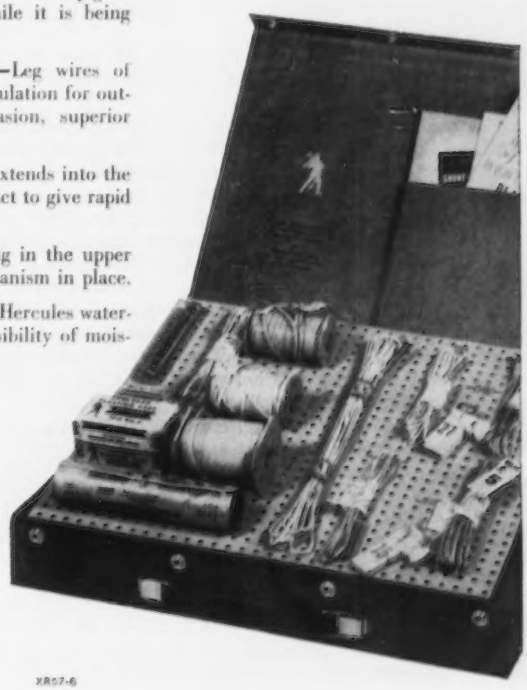

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XR57-6

WASHINGTON IMPACT

Highlights

STOCKPILE REVIEW—Office of Defense Mobilization is making headlines in Washington with its recently announced review of stockpile goals and Government purchase programs. Using the Administration's familiar citizen committee study approach, defense mobilizer Gordon Gray has set a target date of early next January for the group to come up with specific recommendations.

The obvious inference is being drawn that defense budget hold-downs and revised military requirement estimates will sharply cut back, if not entirely snuff out, Government buys of metals and minerals, which make up the bulk of the Government's $6.5-billion stockpile of strategic materials.

But this is only part of the story, and a misleading one at that. Gray promised Congress last spring he would take another periodic look at purchase goals in light of defense needs. The economy wave puts added political emphasis on the review. But direct military purchases actually account for a relatively small part of the Government's metals and mineral buys, and this is the purchase program that is feeling the economy pinch the most.

In fact, the Bureau of the Budget, in a recent analysis of fiscal obligations, reported that stockpile funds for the current year will have to be increased by $165-million to take care of aluminum puts to the Government. The figure will be upped further if copper producers follow suit as expected.

More important even than the fact that some Government incentive purchases can be expected to continue is that the stockpile programs are about at an end anyway—regardless of current talk of belt-tightening. And they have been slowing down for some time.

Therefore experts doubt that the ODM stockpile review will have much effect on Government metals and minerals buys one way or the other. Some buying will continue for at least the immediate future.

LEAD & ZINC TARIFFS—Tariff Commission hearings on the industry Emergency Committee's request for higher import duties get under way this month, on the 19th. The 50% increase allowable under legal limits is a good bet to get the Commission's approval, and a White House okay is also likely.

But the Emergency Committee got a turndown on one of its pleas at the same time the Commission scheduled hearings, and another of its requests is very much up in the air.

The turndown came on the Committee's request that manufactured lead and zinc products be included in the Commission's findings. The tariff group refused on grounds that the producers' committee is not the proper source for such a request.

Domestic mines hoped by inclusion of processed items to get more support for higher tariffs from processors who are now interested or who outright oppose anything that would drive up their costs of pig and slab metal. Now the Committee has given up on this hope.

The other question involves the Committee's request for quota limitations in imports in addition to higher tariffs. From the beginning, the Committee was faced with a knotty problem in drawing up a quota plan which would cover all different types and grades of ores and metal, and win unanimous industry supports.

Even if the Commission approves quotas—a measure it rarely recommends—the White House is no sure bet to go along.

NICARO SALE—Unofficially, General Services Administration has been concerned over talk in Washington that sale of the Government's nickel plant at Nicaro, Cuba, involves legal and political headaches that spell trouble for its private purchaser. GSA-ers say there is no real obstacle to complicate its sale or lease.

Actually, the Cuban government may not perpetuate the tax exemptions for a private owner it has for the U. S. Government. Also, the Defense Department authority for approving the sale is contingent on assuring continued adequate military supplies of nickel.

Tax Depletion Ruling Stirs Mining Studies

MINING LAWYERS will be hashing over the Supreme Court's ruling on tax depletion allowances last month for some time to come, to see how significantly it may affect metals and minerals processing.

By refusing to review 13 lower court decisions on allowable depletion deductions taken by brick and tile clay producers, the High Court ruled in effect that a mine operator may claim depletion allowances on certain manufacturing, processing and other non-mining activities.

The key wording in the tax laws and the lower court decisions centers around the phrase "ordinary treatment processes involved in producing a commercially marketable product." If a mine owner's non-mining processing meets this test, he then may claim the tax depletion percentage applicable to his product on the income from that processing, as well as from income on his extractive process.

What neither the law nor the courts have made clear is what "ordinary treatment processes" are necessary to turning out "commercially marketable" items. In the brick and tile clay cases, some 13 processing steps were involved—five of which the Government had allowed as eligible, and all of which the Supreme Court action included.

Initial reaction among Washington tax lawyers is that minerals rather than metals will be the main beneficiaries. Such metals as copper, lead, zinc, gold and silver, for example, don't need any manufacturing or processing to make them commercially marketable—other than the processing which already is regarded for tax purposes as an integral part of their mining and thus eligible for the depletion allowances.

Aluminum, nickel and tungsten, on the other hand, pose a tougher problem. There's the question of bauxite processing through the alumina step before it becomes aluminum, and there are processes of upgrading nickel and nickel alloys and certain grades of tungsten which now may be eligible.

The confusion all this has created is shown by conflicting statements immediately following the High Court ruling, however. For example, one Government tax expert was quick to point out in the case of bauxite that it is a commercially marketable product in itself—sold as an abrasive—totally aside from its role in the making of aluminum.

Other experts are sure to raise the question of whether certain low-grades of nickel and tungsten are marketable without beneficiation or other upgrading processes—certainly they are not always acceptable for Government or military purposes items in their lower grades.

Government tax people are guessing that the new ruling will have more

wide applications in the minerals field—where many items require a good deal of processing before they are marketable.

Borax and potash producers may get some new benefits, for example. But another major mineral, sulphur, may not—because it, too, can be sold in crude form.

There are two possible upshots of the Supreme Court's action. One is that the Government may ask Congress to define more clearly the "ordinary treatment" necessary in the production of a commercially marketable item. Or, if the Administration decides not to risk opening up such a pandora's box of case-by-case determinations on Capitol Hill, Congressional tax committees may undertake a study of the situation on their own.

AS&R Settle Anti-Trust Suit: Denies Illegality

THE FIRST and most far-reaching anti-trust action filed by the Eisenhower Administration in the mining field was settled out of court when American Smelting & Refining Co. signed a consent decree with the Justice Department in its lead and zinc mining and marketing case. The case also involves St. Joseph Lead Co., which is still negotiating its part of the settlement.

The Government's charges, brought back in 1953, accused AS&R and St. Joe of conspiring to monopolize foreign and domestic production and sales of over 80% of total U. S. domestic and imported supplies of these metals, through illegal production and pricing contracts and agreements.

The companies denied the illegality and impropriety of the contracts and marketing practices cited, arguing that they have been common and accepted practices in the industry for as much as 50 years. The defendants also said many of the charges were out of date, involving agreements and contracts many years previous and no longer in force.

In agreeing to the settlement, AS&R president R. Worth Vaughan explained that his company signed to avoid a drawn-out and expensive legal battle. Under the decree, AS&R promised:

Not to enter any price-fixing agreement with any competitor, and specifically not to exchange price information or consult in price changes with St. Joe;

Not to limit or restrict lead production in the U. S. or imports and exports;

Not to acquire any domestic lead smelter or refinery for 10 years, and thereafter only with Federal Court permission;

Not to sign any toll contract for smelting or refining which puts a competitor out of business;

Not to restrict the amount of lead St. Joe may refine for itself; and

Not to refine any lead for St. Joe after seven years without Justice Department or court approval.

Labor This Month

MINE-MILL CUSHIONS JOB LOSS: Falling employment in non-ferrous mining is the number one concern of officials of the International Union of Mine Mill and Smelter Workers. What to do about it is a top priority project around MMSW headquarters. The strategy is to concentrate on those fringe benefits that become especially important during extended unemployment periods—health and welfare plans and pensions.

Union officials will be holding conferences throughout the winter in Mine-Mill regions on the union's health and welfare plan and how to get the most out of it. Another topic at union headquarters is pensions. With jobs at a premium, retirement takes on more importance among the older workers.

NEW LABOR-MANAGEMENT RULES COMING: The Supreme Court is heading into a heavy season of labor cases—and many of the decisions will set new rules of behavior for labor and management. Even though the Taft-Hartley act is 10 years old, there's a large unsettled area on just how the law should be applied. All of these important questions have been through the National Labor Relations Board and the lower courts—with no final answer. Now they go to the nine justices on the High Court. These are some of the big issues:

- Whether a union can demand a contract clause from a union forbidding strikes unless they are approved by a majority vote of all employees. The NLRB has ruled no; a lower court, yes.
- Can a union with a "hot cargo" contract try to enforce this clause by a direct appeal to the employees. (This clause allows employees to refuse to handle goods of a neutral employer doing business with their employer.) The NLRB says the contract is legal but Taft-Hartley prevents enforcement through the employees. The lower courts have split.
- When can an employer prevent a union from distributing literature on company property? NLRB has ruled that a company can bar such distribution during non-working hours, but cannot forbid it during working hours if supervisors are campaigning at the same time against the union. Lower courts have reversed both NLRB rulings.
- State versus Federal jurisdiction—this time whether the states have a right to bar picketing if such activity is covered by Taft-Hartley and free speech rights of union. This is one of a series of cases involving the rights of states to act in labor cases in interstate commerce.

KEY CASES BEGIN THE TREADMILL: Some important new decisions are just coming along from the National Labor Relations Board. They'll probably be on the legal treadmill before the end of 1958. But, for the time being, at least, the way the NLRB handles them will be the ground rules for management and labor.

During the past year, NLRB has been comparatively quiet under its new chairman Boyd Leedom, ex-judge of the South Dakota Supreme Court. The five-man agency had no new policy decisions to turn out; it has concentrated on reducing the heavy backlog of cases. Now, they're running into some important decisions. Among the toughest are these subjects:

- Organizational picketing. Can a union which has lost a representation election among the employees continue to picket their company to win a bargaining contract?
- Construction union jurisdiction. Should the Board make its own independent jurisdictional rulings for the building trades unions and contractors or should it continue to rely on the independent national joint board which has handled such cases for the past 10 years.
- NLRB jurisdiction. This is an administrative matter; whether the NLRB should expand its jurisdiction to take on additional cases. The Board, two years ago, set limits on the size of the cases it would take to cut down its heavy agenda. Labor unions have complained ever since that many small cases have no way to a solution since the states can't take over if they fall within the Board's jurisdiction—even where the Board has relinquished it.

A NEW* kind

Here's proof the new Athey 3-door design works! Note the high crest of the dumped material. No tie-ups, trailer rides easily away from load.

*Low loading height, easier to load, better stability and roadability

Low loading height of 8′ 9½″ (average) and low center of gravity are additional PW20 advantages. Shovel cycles are faster, hourly production increased. And you get better roadability at high speeds, on turns, with the PW20's low center of gravity.

*Trailer capacity nearly 4 times trailer weight with "T-1" steel

The latest in the earthmoving field! It's the new Athey PW20 Bottom Dump Trailer and it's loaded with new design features.

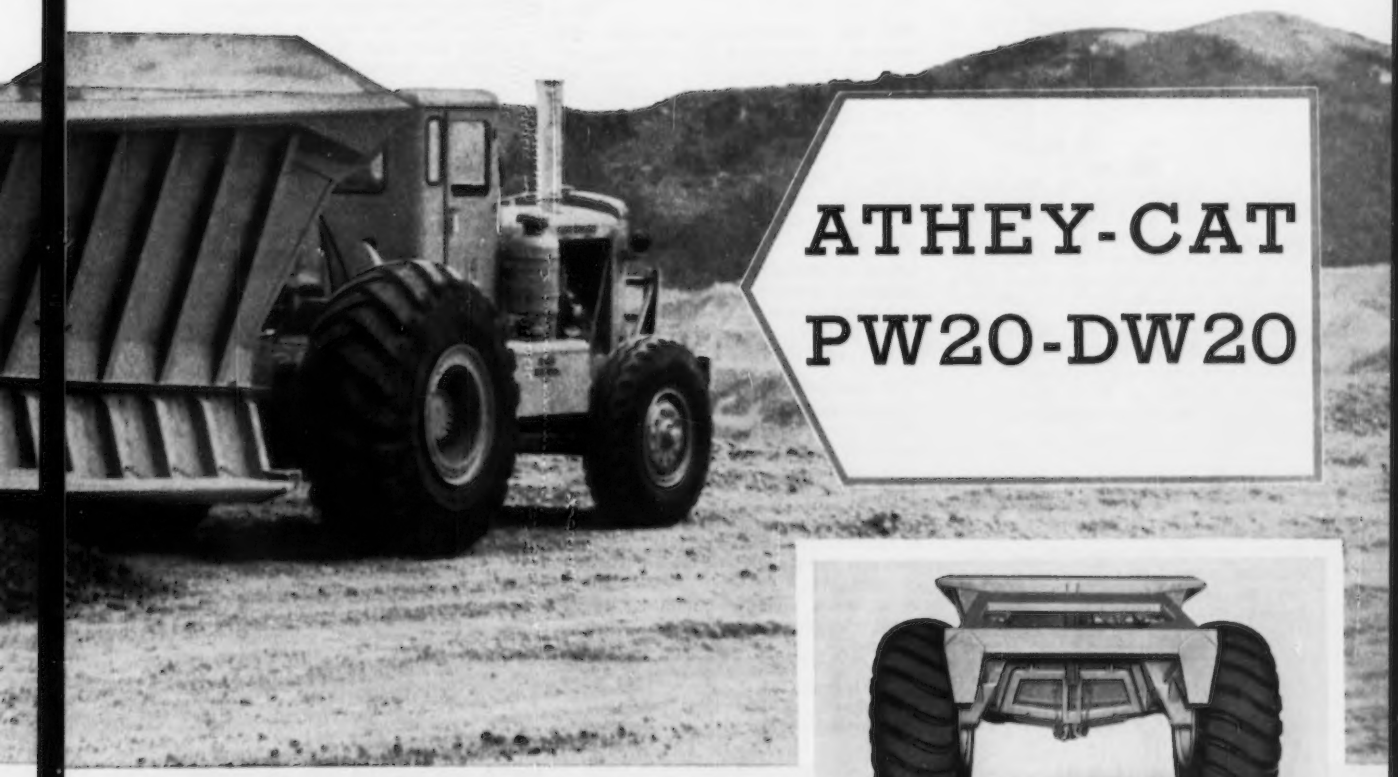
Constructed of high-strength "T-1" steel, the PW20 is trimmed of excess weight, capable of handling 40-ton payloads at less cost. The capacity of the PW20 is nearly 4 times the trailer weight.

An exclusive high arch axle and 3-door design eliminate resistance of the dumped material. The load is dumped through three doors; two extra wide bottom doors and a rear door. The unit rolls easily away from the dumped load, without tire spinning, cutting time from your dumping cycles.

Combined with the Cat DW20 Tractor, the new PW20 offers you big capacity payloads, high-speed hauling, fast loading, instantaneous dumping, high production and low maintenance.

Get the complete story on the Athey-Cat PW20-DW20 Bottom Dump. Your Athey-Caterpillar Dealer can furnish you all the facts, or write direct for the new PW20 booklet.

# of Bottom Dump!



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Rear door positively locked in place by cable pressure. Complete insurance against haul road spillage. As bottom doors open and cable slackens . . .

REAR DOOR OPEN

Spring loaded rear door swings upward providing clear opening; material flows out behind wheels.

*New, exclusive 3-door design— high arch axle end dumping tie-ups

A rear discharge door, extra high clearance, and arch axle design are exclusive PW20 features. The PW20 rides away from the load with minimum resistance from the dumped material. You have no more "bogging down" at the dump common with old fashioned bottom dump rigs. You reduce "pushing" and save dumping time. Dumping is instantaneous and clean with 6-foot-wide bottom doors, rear door and steep sloping body sides. And if you want to spread or control the load, you can do so with the PW20's dependable, hydraulic-actuated dumping mechanism. No other hauling unit has the engineering features of the PW20 — features that add up to increased production at lower costs per yard.

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Athey

WHAT'S NEW IN U.S. PATENTS

OLIVER S. NORTH

Exploration

Recording seismic information so as to cause reflected waves to be additive, whereas most of the other waves cancel one another. E. G. Schempf, assigned to Precision Exploration Co. No. 2,806,545.

Mining

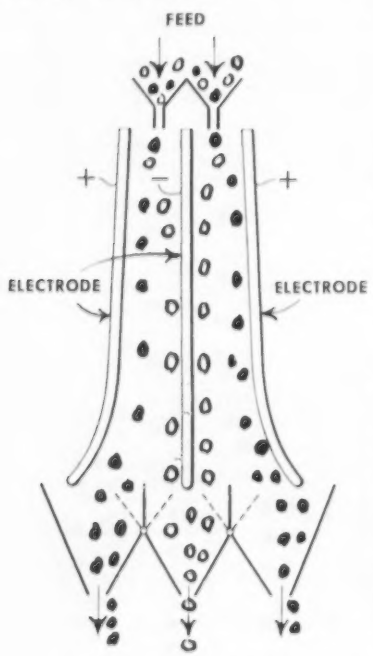
Method of manufacturing low-cost blasting mats from worn tire casings. Tires are cut into strips and bands, which are interwoven to form a lightweight, easily handled mat for covering faces being blasted. O. Klokseth. No. 2,806,426.

Drill wagon for use in small tunnel sections. All equipment necessary for drilling operations can be transported to the face thereon. J. P. Danielsson, assigned to Atlas Copco Aktiebolag. No. 2,806,673.

Metal and Mineral Processing

Ore Dressing

Simple, rugged attrition mill for comminuting mineral ores. Fineness of grind can be accurately controlled. R. B. Records. No. 2,807,424.



Improved methods for electrostatic concentration of nonmetallic ores, such as phosphates and potash materials. Ore is ground, heated, caused to become charged, and passed through one or more electrostatic units while still hot. Spodumene, lepidolite, barite, fluorspar, brucite-magnesite, feldspar, kyanite, and wollastonite also can be beneficiated by these methods. J. E. Lawver, assigned to International Minerals & Chemical Corp. No. 2,805,768-71.

Dry ore concentrating apparatus and method. Combination of gravity separation and air agitation is used instead of mechanical shaking. Separation of values from gangue is preserved without interruption of the operation. When a substantial quantity of values has accumulated, it can be recovered easily and with minimum shutdown period. A. C. Putnam, assigned to Robert W. Beach. No. 2,806,601.

Improved method and apparatus for depolarizing magnetic concentrates, such as magnetic taconite. L. G. Hendrickson and M. F. Williams, assigned to United States Steel Corp. No. 2,807,363.

Wet apparatus for classifying gold ore concentrates. Principal advantage is its ability to recover oversize nuggets without their being recycled to grinding mill with other oversize. P. L. Gregersen. No. 2,806,597.

Liquid cyclone apparatus for separation of extremely fine precious metals or other minerals from water suspension. Danger of creation of "water hammer" action in separator cone is minimized by a novel vacuum control. B. E. Patrick, assigned to Irene Cottrell. No. 2,806,599.

COPIES OF U. S. Patents can be purchased at 25¢ each from the Commissioner of Patents, Washington 25, D. C.

Hydrometallurgy

Gaseous precipitation of oxide-free copper, nickel, or cobalt powder from a solution of a dissolved salt of at least one of those metals. Metal powder, or "seed," is added to the solution, and the salt reduced to metal form with hydrogen. P. J. McGauley, assigned to American Cyanamid Co. No. 2,805,139.

Reduction process for producing copper, nickel, or cobalt powder of uniform particle size. Concentrated slurry of the metal oxide or hydroxide is heated to a temperature of 100 to 500 deg F under pressure and with a non-sulphidizing reducing gas. When reduction to metal state is completed, the slurry is cooled and solids recovered by filtration. F. A. Schaufelberger, assigned to American Cyanamid Co. No. 2,805,149.

Process for precipitating zinc from ammoniacal-ammonium carbonate leach liquors containing other dissolved nonferrous metals, particularly copper. Excess NH_3 is removed from the end liquor by controlled volatilization. Precipitated zinc product is essentially free of copper ions, which remain in solution. G. Van Hare, Jr., and L. N. Allen, Jr. No. 2,805,918.

Selective leaching of copper, nickel, cobalt, silver, gold, and the like from arsenide, antimonide, selenide, and telluride ores. Crushed ore is slurried with aqueous H_2SO_4. Nitric acid is added and the slurry heated under oxidizing conditions at an HNO_3 concentration of 1 to 5%. Desired metal is converted to sulphate form and dissolves, while the low-valence metalloid remains undissolved. F. A. Schaufelberger. No. 2,805,936.

Method of treating low-grade iron ores, especially Cuban laterites, to produce an iron-bearing product suitable for smelting or open-hearth furnacing. Other metal values, particularly nickel and cobalt, are recoverable from the residual solution. F. A. Schaufelberger, assigned to Chemical Construction Corp. No. 2,805,939.

Two-stage leaching process for recovering cobalt and nickel from ores that contain also arsenic, antimony, selenium, or tellurium. Pyrite is dissolved in nitric acid and then ground ore is added to the solution. The slurry is heated under pressure, with stirring, for about 1½ hours. The cobalt and nickel enter solution and are recovered by conventional methods. H. O. Bennedsen. No. 2,805,940.

Recovery of uranium from leached residue of clinker process phosphoric acid. Mud is ground, dried and roasted, and the roasted material digested in a strong mineral acid. Acid and solubilized uranium are then washed out with water, and uranium recovered therefrom. F. T. Fitch and M. P. From, assigned to W. R. Grace & Co. No. 2,806,763.

Uranium recovery and purification process. A contaminated aqueous solution containing uranium is treated with HCl and a soluble chloride to obtain a uranyl chloride complex anion, which is adsorbed onto a highly basic anionic exchange resin. Occluded solution and impurities are washed from the resin with HCl. Uranium values are eluted, reduced to the tetravalent state by electrolysis, and precipitated with HF as uranium tetrafluoride. R. H. Bailes, R. S. Long and R. R. Grinstead, assigned to U. S. Atomic Energy Commission. No. 2,806,764.

Purification of caustic aluminate liquors used in Bayer-Process alumina production. Adverse effects of organic substances that inhibit settling and precipitation of alumina are offset while concurrently providing a control of process carbonation and a recovery of the Na_2O as caustic soda. A. A. Anderson, assigned to Kaiser Aluminum & Chemical Corp. No. 2,806,766.

Improved carbonate leaching of carnotite or other uranium-vanadium ores. Sodium amalgams are utilized under certain critical conditions to precipitate both U and V values. D. A. Ellis and R. O. Lindblom, assigned to U. S. Atomic Energy Commission. No. 2,807,518.

Method for recovering native silver from copper sulphide flotation concentrates. Concentrate is contacted with carbonate

Mr. North is a patent consultant, Washington, D. C.

ON THE go

by J. Hall Carpenter

CARPCO ROTATING FIELD MAGNETIC SEPARATORS were developed particularly to separate magnetite and other highly magnetic materials in the dry state. The novel design permits clean extraction of the magnetic materials with no moving parts exposed to the materials being separated. The rotating field separators are now offered in 6", 18" and 36" models. The 6" models are designed primarily for laboratory use. The 18" and 36" models are designed for industrial use and can be stacked to give either multiple passes or to be fed separately to give large tonnage throughput. Bulletin RFB-101 is available on request.

ANGOLA, AFRICA is one of the countries I will be visiting this month to study the best methods of mining and beneficiating for their diversified suites of mineral deposits. Angola, with a large potential of mineral wealth, has iron ore, manganese, titanium, columbium, and tantalum, and will no doubt be one of the great sources of the world's supply of minerals.

SILICON SEMI-CONDUCTORS, incorporated in an ingenious way, are used in all the MRS and FRS units developed by Carpco. Giving constantly variable direct current, they are now used by Carpco to control all variable speed drives and magnetic field intensities. The use of MRS and FRS devices eliminates motor generator sets, selenium and tube type rectifiers formerly used and allows a new high-degree of automation in separation plants. Literature is available on request.

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CARPCO CONSTRUCTION CORPORATION • CARPCO EXPORT CORPORATION
JACKSONVILLE, FLORIDA, U. S. A.

leach solution containing no foam depressant, and oxygen gas passed through the suspension. Copper values are dissolved, and silver values floated. H. A. Abramson, assigned to Calumet & Hecla, Inc. No. 2,807,533.

Pyrometallurgy

Production of strong chromium-ore briquettes for chlorination in a shaft furnace. Metal oxide material, such as ilmenite or chromite, is mixed with soft-coking coal and previously carbonized material, and the mixture agitated at a temperature at which the coal components fuse and become sticky. Product forms into balls, which are calcined at elevated temperature to remove volatile hydrocarbons. Briquettes thus produced are well bonded and show little tendency to disintegrate during chlorination. E. K. Plant, assigned to Columbia-Southern Chemical Corp. No. 2,805,120.

Production of a weatherproof synthetic chromium ore for use in metallurgical operations. Low-grade chromite is mixed with sodium carbonate and calcined in a rotary kiln at 900 to 1200 deg C., and the sodium chromate thus produced is separated and treated with CO_2 to precipitate chromium hydroxide. Material is then washed and filtered, and the filter cake dried, mixed with a binder, pelletized and fired. Resulting pellets are dense, hard and extremely resistant to weathering when stored in the open. J. C. Schumacher, assigned to American Potash & Chemical Corp. No. 2,805,140.

Improved method of pelletizing iron ore by heating ore compacts in an oxidizing atmosphere in which at least part of the fuel present is in the form of a surface coating of coal on the outside surface of the pellets. Green pellets are rolled in powdered coal before being charged to the moving grate furnace. Such pellets can be burned at a faster rate, thus increasing furnace capacity. W. E. Apuli, assigned to the Regents of the University of Minnesota. No. 2,805,-141.

Method of producing ferromanganese from blast furnace flue dust enriched in both manganese and coke. Dust is enclosed in a steel can containing air and subjected to reaction-inducing temperature to reduce the manganese, meanwhile venting derived CO gas to atmosphere. When reduction is substantially completed, the can is intensely heated until it melts and becomes alloyed with its contents. Resulting metal alloy is recovered. J. J. Howard, assigned to John Conlan Howard. No. 2,805,146.

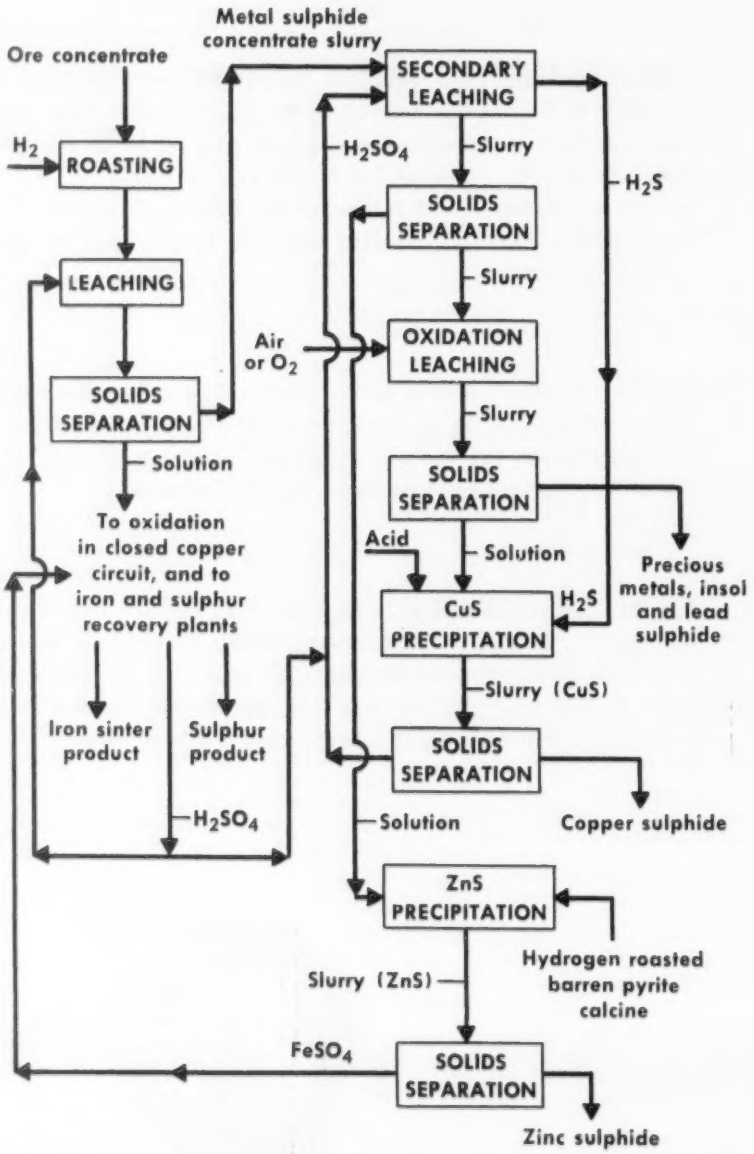
Economic continuous process for chlorinating titanium ores, slags, and the like. Raw material is charged at shaft furnace top, and chlorine gas is blown upward from the bottom. Titanium is volatilized as the chloride. Residue is treated with gaseous oxygen to reduce non-volatile metal chlorides to metal oxides. Liberated chlorine gas rises to chlorinating zone, where it reacts with additional ore or slag. H. Ishizuka. No. 2,805,919.

Batch process reduction of iron oxide ores. Furnacing time is short, resulting in increased output per furnace. L. E. Schroth, assigned to Combustion Processes Co. No. 2,806,780.

Improved furnace for reducing oxide ores of nickel, cobalt, or copper. Material is heated evenly throughout and with minimum sintering against muffle wall, resulting in longer furnace life. H. E. Tschop, J. E. Carter and C. B. Goodrich, assigned to International Nickel Co. No. 2,806,783.

High green-strength furnace-grade iron agglomerates are made by mixing bentonite with ore fines whereby bentonite concentration is greater near the pellet surface than at its center. Bentonite is added after the balling process has been initiated. K. M. Haley and H. V. Trask, Oglebay, Norton & Co. No. 2,807,534.

SULPHIDE HYDROMETALLURGY



Hydrometallurgical process for separating iron and sulphur from sulphide ores, ore concentrates, mattes, and the like. Method has a wide range of applicability. Drawing shows the method as applied to sulphide ores of zinc, copper, lead, iron and precious metals. P. J. McGauley. No. 2,805,938.

Walworth iron body saddle type wedge gate valves are suitable for use on steam, water, gas, gasoline, oil, and many process lines. They are easy to take apart, simple to service, fast to reassemble. Walworth saddle-type valves are available in a wide range of sizes in eleven different combinations of design and materials including bronze-mounted, all-iron, and ni-resist; with both flanged and screwed ends. All types can be repacked under pressure when fully opened or fully closed.

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Mivenca Plans $52-Million Iron Mine

A NEW IRON MINING COMPANY, Mineroferroviaria de Venezuela, C. A., will invest some $52-million to tap a 150-million ton hematite orebody located 55 miles south of the Orinoco River. "Mivenca" expects to start shipping before July 31, 1959 from the El Trueno deposit. Date is the deadline for commitments to steel firms in the U. S., Germany and Belgium.

Initial output of El Trueno is scheduled at 3.5-million metric tons annually of ore averaging 62% iron content. Exports are expected to rise to 7-million tons within three years.

Mivenca will develop 14,820 acres of concessions southwest of Ciudad Bolivar, containing 150-million proven tons of high grade ore and reserves estimated at several times that figure. Mining will be by open pit methods.

The project involves construction of a 90-mile railroad and dock facilities at Orocopiche, three miles west of Ciudad Bolivar on the Orinoco river. Work was to start after closing of the stock sale on Oct. 31. Installations are scheduled for completion within 20 months.

Mivenca will operate the concessions under a profit-split agreement with Trans Western de Venezuela, C. A., a mixed U. S.-Venezuelan company in which Western Oil Fields, Inc., Denver, is the biggest shareholder. Trans Western, which owns the concessions, will take a 50% share of net profits.

Wendell Anderson, former president of Crucible Steel Corp., and Struve Hensel, Washington attorney and former U. S. Undersecretary of Defense, have been named directors of the firm.

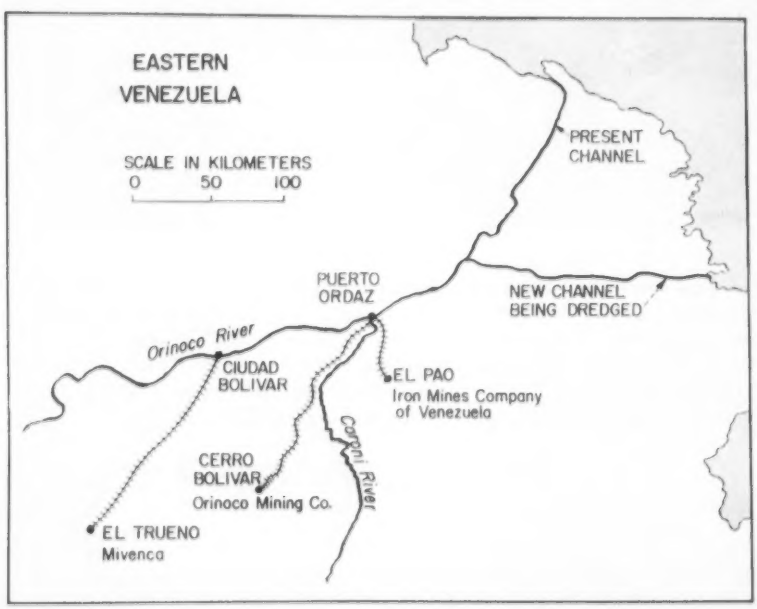
President of the company is Dr. Lucio Baldo, former Director of Industries in the Ministry of Development. He revealed in Caracas that commitments for ore purchases have been made by Barium Steel Corp. and Colorado Fuel & Iron Co. in the U. S.; Metallurgie Liegeoise in Belgium; and Klockner & Co. in Germany.

Total commitments are around 1,250,000 tons for U. S. companies, 650,000 tons for the German firm and 2.2-million tons for the Belgian company. Additional sales contracts are expected to raise the total for Germany to 1-million tons. Mivenca is also negotiating with three Japanese groups. Commitments hinge on start of deliveries by July 31, 1959.

Mivenca plans to invest $52-million, of which approximately $8.7-million will be in deferred payments to construction contractors and suppliers, who have agreed to accept up to 20% of contract payments after operations have commenced. Another $9.3-million will be in the form of endorsed notes to suppliers of materials and equipment.

Biggest outlay will be $32-million for the railroad, including rights of way, shops, signal system and rolling stock. Investment in docks and loading equipment at Orocopiche is calculated at $5.5-million. Cost of mining, pulverizing, classifying, concentrating and transport equipment and installations will be $4.9-million.

Other major outlays are $1.5-million for camps, $3-million for plans and administration, and $5-million for working capital including interest charges during construction. Studies of projected installations were carried out by Paul G. Van Sickle & Associates, Denver, and other U. S. engineering firms.



Mivenca will be Venezuela's third iron mining venture. Iron Mines Co. of Venezuela, subsidiary of Bethlehem Steel, has been exporting ore since 1950 from El Pao. Orinoco Mining Co., U. S. Steel subsidiary, has been in operation since 1954 at Cerro Bolivar. The two companies expect to export a combined total of 15-million metric tons this year, chiefly to the U. S.

Western Ore Co., affiliate of M. A. Hanna Co. and Republic Steel, has 21,000 acres of undeveloped iron ore concessions in Bolivar sta.e. There are three other concessions in effect; the rest of the iron ore region in eastern Venezuela has been declared a national reserve.

Directors of Mivenca are Alfredo Brandt, former president of Banco Mercantil y Agricola; J. J. Gonzalez Gorrondona, president of Banco Nacional de Descuento and former president of the Central Bank of Venezuela; Jesus Maria Herrera Mendoza, prominent Caracas businessman; and Salvador Salvatierra, president of Banco Union.

Trans Western de Venezuela, owner of 12 concessions covering the El Trueno deposits, is headed by Dr. Carlos Guinand Baldo, president of the Caracas construction firm of Constructora Nacional de Tuneles y Carreteras, C. A. (Conticca). Among stockholders is Paul G. Van Sickle, president of Paul G. Van Sickle & Associates, Denver—an engineering firm which made studies for the Venezuelan national railway system now under construction.

El Trueno iron deposits—70 miles southwest of Cerro Bolivar—were discovered in 1949, when Indians harvesting balata and tonka beans in the area reported mineral outcrops. Fifty-year concessions were granted to a local group in 1952.

Cleveland-Cliffs Co. took a purchase option in 1953, but did not exercise it. Van Sickle took an option in 1955 and later transferred it to Trans Western, which bought the concessions for $2.5-million.

Iron ore at El Trueno—as elsewhere in the area south of the Orinoco—occurs in hills or "cerros", covered by a few feet of overburden. In 1953, a U. S. surveying firm proved out 150-million tons of reserves in one-fifth of the concession area.

Mivenca estimates that its cost per ton of ore landed in U. S. ports will be $9—leaving a gross profit of better than $4 a ton at current prices. Present f. o. b. price at Orinoco Mining Co.'s docks in Puerto Ordaz is $0.1231 per natural iron unit.

Production of El Trueno is expected to increase from 3.5-million tons the first year, to 5-million the second year and 7-million thereafter. Increases beyond that figure would require additional mining and loading equipment.

Big ore carriers with cargoes of up

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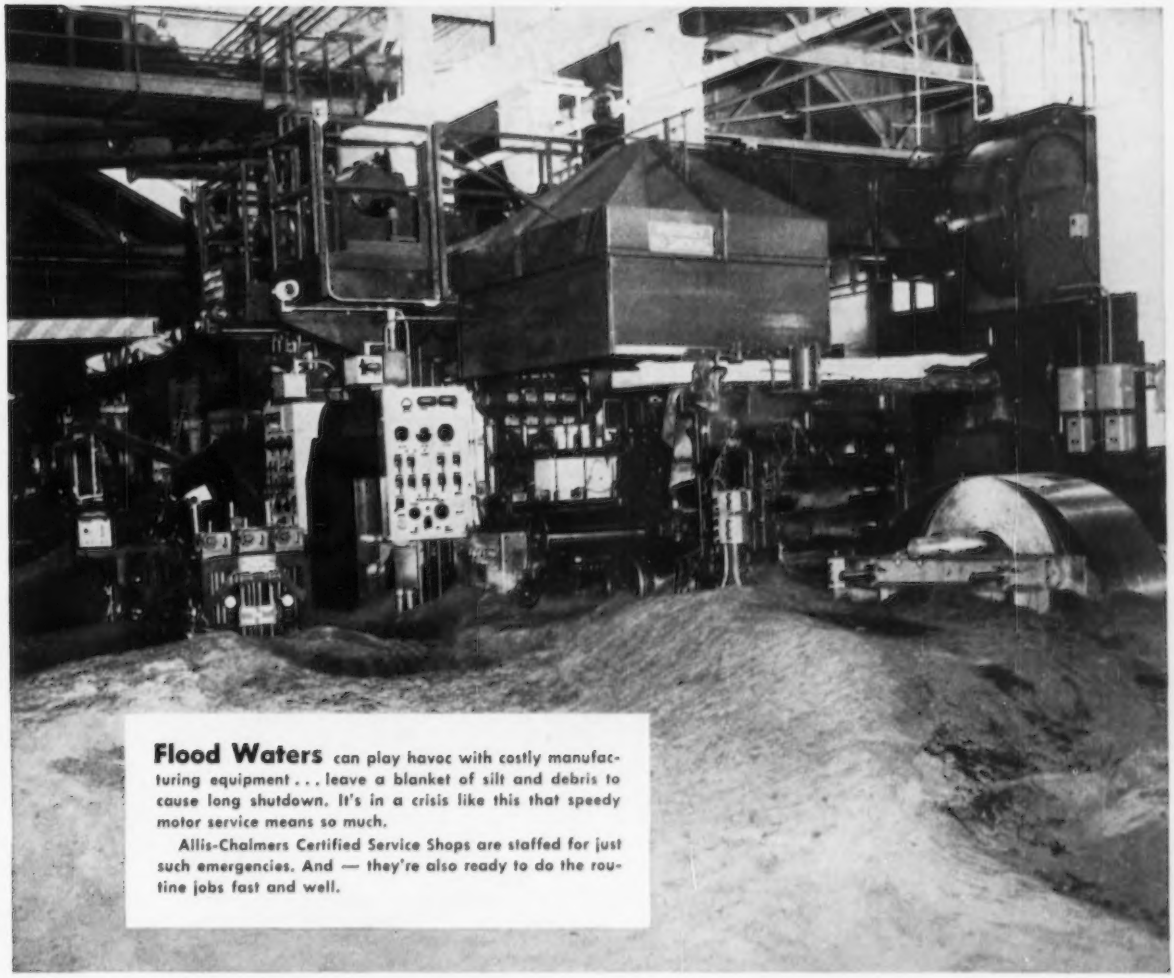

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NEW CEMENT PLANT OPENS IN INDONESIA

Special to The New York Times.

JAKARTA, Indonesia, Aug. 7 —Asia's most modern cement plant, an impressive example of Indonesian-United States cooperation, was formally dedicated today by President Sukarno in East Java.

The ceremony in the newly constructed industrial compound at Gresik, near Surabaya, represented an important event in the history of underdeveloped Indonesia, now struggling through her worst economic crisis. The cement plant, sprawling over several acres is expected to make a major contribution in helping strengthen the nation's economy and spur new industries.

From Gresik cement will be transported to scattered areas of the archipelago. Today's cement at Gresik will be tomorrow's new schools, houses, dams, hospitals, factories and bridges, all of which are badly needed by Indonesia's 82,000,000 people.

In a dedication speech, as reported here, President Sukarno thanked the United States for financial and technical cooperation in building the Gresik works.

Cement experts said the plant had a capacity of 250,000 tons of cement a year, about 75,000 tons more than total present production. They said the plant was expected to save Indonesia about $7,000 a day in foreign exchange.

Reprinted from
The New York Times, August 8, 1957

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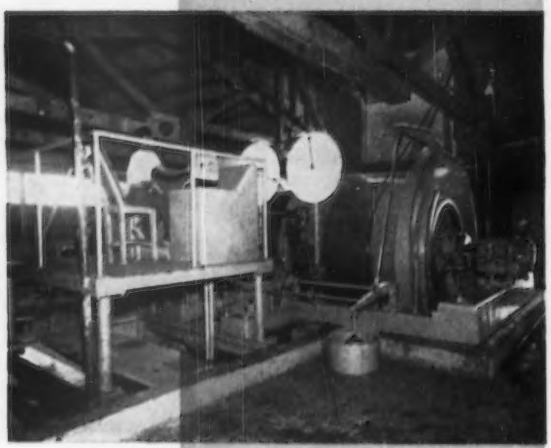

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Mivenca *(Continued)*

to 35,000 tons can navigate the muddy Orinoco for 154 nautical miles as far as Puerto Ordaz, through a channel dredged by Orinoco Mining. The National Institute of Channels collects tolls from ore ships and other craft, under an agreement with the U. S. Steel subsidiary.

The government is studying plans for dredging the river another 65 miles between Puerto Ordaz and Ciudad Bolivar. Orinoco Mining is currently dredging a new channel through the river delta at a cost of $9-million.

Total investment in iron mining in Venezuela is estimated at around $400-million at present. Official U. S. estimates foresee average annual imports of 25-million tons of Venezuelan ore in the period 1955-1965, and 40-million tons annually in the following decade.

Iron Mines Co. of Venezuela ships all of its ore to Bethlehem's Sparrows Point, Md., steel mill. Orinoco Mining exports about two-thirds of its output to U. S. Steel plants in the U. S., the rest to other steelmakers in the U. S., Europe and Japan.

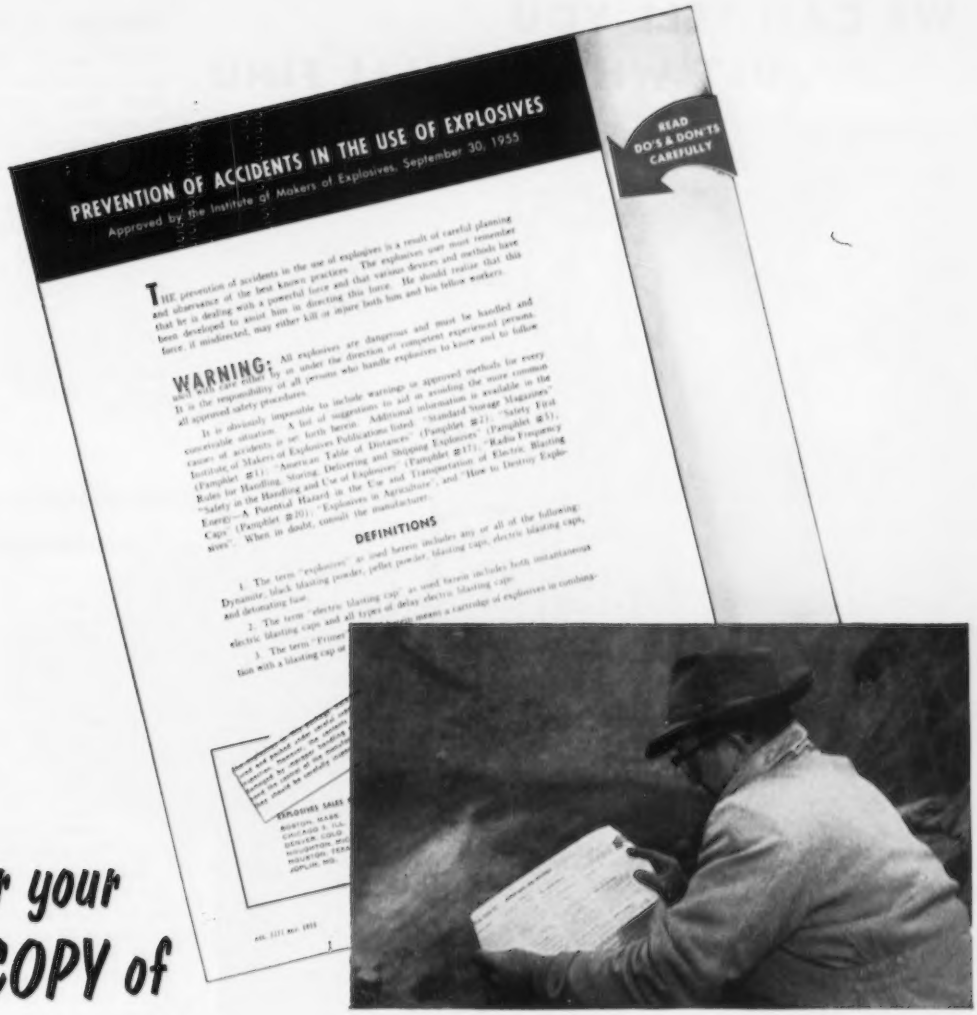
Iron mining operations in Venezuela pay the government a production royalty of 1%, as well as normal corporate taxes ranging up to 26% on annual profits of $8.4-million or more. Tax legislation analogous to the "fifty-fifty" oil law provides for a special surtax to equalize the government's tax revenue and the company's net profits, if profits exceed 15% on net worth in any tax year.

St. Louis Section, AIME Tours Fluorspar Center

THE FIRST specially organized fluorspar field trip to Hardin County, Ill. for the St. Louis section, AIME, was held Oct. 11. Gill Montgomery, general manager of the fluorspar division, Minerva Oil Co., was field trip chairman for the day and J. Blecheisen was registration chairman. Mr. Blecheisen is president of the Rosiclare Lead & Fluorspar Mining Co., Rosiclare, Ill.

Over 150-mining engineers, metallurgists, geologists, executives of mining companies, and representatives of fluorspar consumers, such as steel, aluminum, hydrofluoric acid and ceramic producers, attended the field trip, inspecting on guided tours the major underground fluorspar mines and mills of the area. Representatives from the Illinois Geological Survey and the Missouri Geological Survey, and faculty and students from the University of Illinois and Southern Illinois University also attended.

Fluorspar mining company hosts were: Aluminum Co. of America, Fluorspar Division (W. S. Skeels, works manager); Ozark Mahoning Mining Co. (A. G. Johnson, vice president); Minerva Oil Co., Fluorspar Division (Gill Montgomery, vice president), and Rosiclare Lead & Fluorspar Mining Co. (J. Blecheisen, president), whose fluorspar mines and mills are located in Hardin County, and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Approved by the Institute of Makers of Explosives, September 30, 1955
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Fluorspar *(Continued)*

whose annual production historically accounts for more than 50% of America's total annual fluorspar production. Approximately 600,000 tons of fluorspar were consumed in the U. S. in 1956 by the steel, aluminum, hydrofluoric acid and ceramic industries.

AIME members and guests registered at the "Y" building in Rosiclare the morning of Oct. 11 and were served coffee until tour time which started at 9 a.m. A buffet lunch was served there at noon, and at 4 p.m. after the close of the field tours, a "fish fry" was held at the Cave-in-Rock State Park, Hardin County. A fluorspar exhibit was displayed at the "Y" building and fluorspar specimens were distributed at the "fish fry."

How Horizons Produces Pure Thorium Metal

THORIUM, not yet out of the nuclear energy picture, is being produced by Horizons Inc., Cleveland, Ohio, to exacting Atomic Energy Commission specifications (less than one ppm boron). According to Horizons' spokesmen, reactor-grade thorium metal is being produced by fused-salt electrolysis at approximately $2 a lb production cost.

Horizons developed the process as an alternate route other than the expensive Ames Process (see *E&MJ*, November, 1955) whose production costs run between $15 and $20 a lb.

Backbone of the Horizons Process is the preparation of the thorium salt used in the fused-salt reaction.

Process involves reacting thorium nitrate with sodium carbonate to produce thorium oxycarbonate which precipitates as a white salt, eliminating many impurities from the reaction.

Thorium oxide is produced by heating the oxycarbonate, and the oxide is dispersed on lamp black for chlorination. Mixture is chlorinated at a temperature between 1350 to 1400 deg F to produce the tetrachloride which is fused with sodium chloride (30% by weight) to produce the electrolyte.

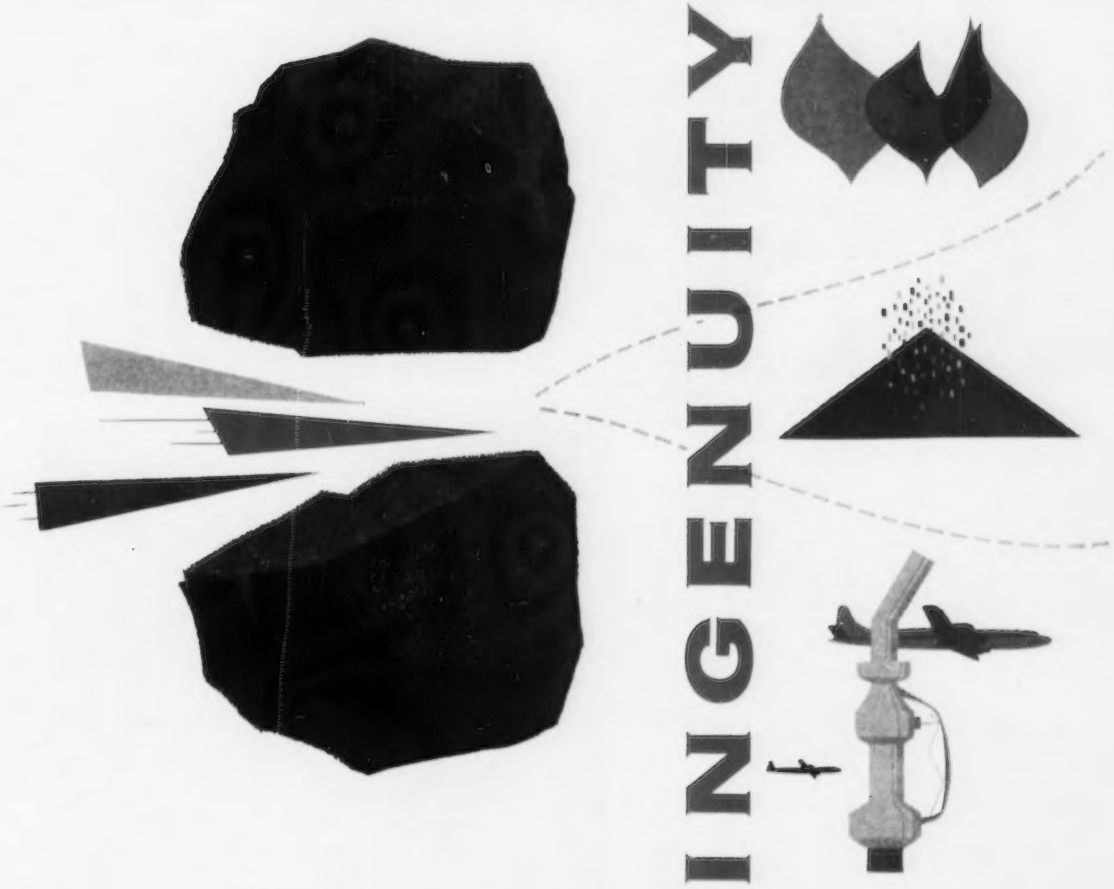
Fused salt is fed to a graphite-lined cell, with the graphite being a positive pole and a removable cathode being negative. Thorium is deposited at the cathode under an inert Argon gas seal. Amperage as high as 7500 amp has been used in the process.

Pend Oreille Miners Oppose Boundary Dam

PROPOSAL of Seattle City Light to build a dam at the boundary site on the Pend Oreille River in northeastern Washington has drawn strong opposition from seven mining companies in the Metaline district of Pend Oreille County, Wash.

The mining firms this week asked the Federal Power Commission to deny the city of Seattle a license for the project. The companies, all of which have hold-

call KE for plant expansion or new facilities



has made KE a major engineer-contractor serving Minerals and Petroleum

Nation's pioneer major commercial Gilsonite refinery near Grand Junction, Colorado... Another example of KE ingenuity.

Ingenuity at work—at American Gilsonite, Kaiser Engineers designed and built an enclosed, controlled-atmosphere calciner with associated power and plant equipment making possible 100% utilization of raw Gilsonite. First major all-commercial Gilsonite refinery built, the new plant produces 99.50% pure coke, extreme purity gasoline, and uses gaseous residue to power the entire facility.

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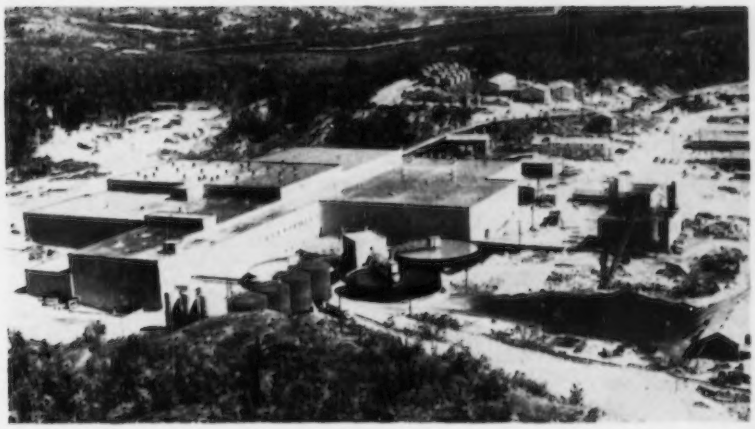

GROUND ORE and water enter new concentrator building through pipeway.

Denison Begins Tapping Huge Ore Reserve

CONSOLIDATED DENISON MINES has officially opened its uranium operation in the Blind River area. The concentrator, which started last May, is averaging 3,100 to 3,200 tpd with rated capacity of 6,000 tpd expected to be reached during the winter or early spring. Grade of ore is running above drill estimates. Drills indicated grade in the No. 1 shaft area is about 2.25 lb uranium oxide.

Company's main ore bed is estimated to contain a probable 137-million tons grading 0.139% uranium oxide, or 2.78 lb per ton. An upper bed is estimated to contain an additional 55-million tons averaging around 1.5 lb per ton. Contract is held with Eldorado Mining & Refining for sale of $201,895,000 worth of uranium precipitates. This is the third largest contract issued to date in Canada.

Pend Oreille *(Continued)*

ings in the Metaline mining district, are Pend Oreille Mines & Metals Co., Grandview Mines, Inc., Bunker Hill Co., Day Mines, Inc., Metaline Contact Mines, Metaline Mining & Leasing Co., and Metaline & Pine Creek Cons. Mining Co.

The group has filed a petition to intervene in the FPC application of Seattle and has asked the FPC to hold a hearing on the application in the Pacific Northwest. It was charged by the mining firms that construction of the dam would raise the water level of the river to the extent that it would endanger what was termed one of the most extensive and valuable mineral deposits of lead and zinc on the North American continent.

It was contended that the hydrostatic heads created by the project would increase the flow of water through natural underground channels. This, it was added, would mean that certain ore would become unmineable, leakage would become uncontrollable and some, if not all, of the mining area below the reservoir level would have to be abandoned.

Petition to intervene said that more than 95% of all known ores and potential ores in the district are below the 1990-ft pool elevation of the proposed project.

According to the petition, the ores of the Josephine horizon of the district are estimated to contain enough zinc to supply the U. S. for 11 years and enough lead to supply the country for five years at the rate of consumption last year.

The mining firms stated in the petition that army engineers decided to shelve the project after a feasibility study in 1947. It was pointed out that a hearing was held by the army engineers at Metaline Falls in 1947 and it was recommended to hold up the project until the mines were worked out.

Since that time, it added, the mining industry and the Federal Government have spent a considerable amount of money exploring the mineral deposits of the district and it has been shown that the mineral wealth is substantially greater than was believed in 1947.

Rio Tinto Lists Current Minerals Exploration

A SERIES OF HEADQUARTERS across Canada are being maintained by Rio Tinto Mining Co.'s exploration arm, according to an October report by the company.

"Riocanex" is prospecting in the Jordan River (B. C.) area, but so far has not found commercial copper; anomalies in the Lac La Ronge (Sask.) area are being checked by ground parties and geophysical parties are studying Beaverlodge. In the Lac La Ronge area, Anglo-Rouyn has already proved 3-million tons of 2% Cu.

Northern Manitoba is being mapped aerially and the Partridge Crop Fault, parallel to Mystery Lake, will be walked. In Ontario, Riocanex and Sogemines, Ltd. will drill a molybdenum property, and assessment work is being completed at Blind River. Mapping is continuing

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From one source, Crosby Laughlin Lebus, you get the world's most complete line of fittings: Crosby Clips and "Load Rated" Blocks; Crosby-Laughlin drop forged shackles, hooks, Missing Links*, turnbuckles, thimbles, and other fittings; famous drop forged Lebus Loadbinders and drop forged Snatchblocks! Your Crosby Laughlin Lebus Distributor is your one stop fittings supplier—see him next time you need *any* fittings!

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Rio Tinto *(Continued)*

in the Noranda area and, according to Dr. D. R. Perry, development of Oceanic Iron Ore of Canada's huge property at Ungava Bay is coming along satisfactorily. Financing would cost an estimated $150-million. Work is also being carried on in New Brunswick.

Aluminum Enters Market As Motor Oil Container

A CONTRACT to supply 35-million one-quart oil cans to Esso Standard Oil Co. has been signed by Reynolds Metals Co. Newest product of aluminum industry research for new consumer uses, the can is expected to find use in other container applications.

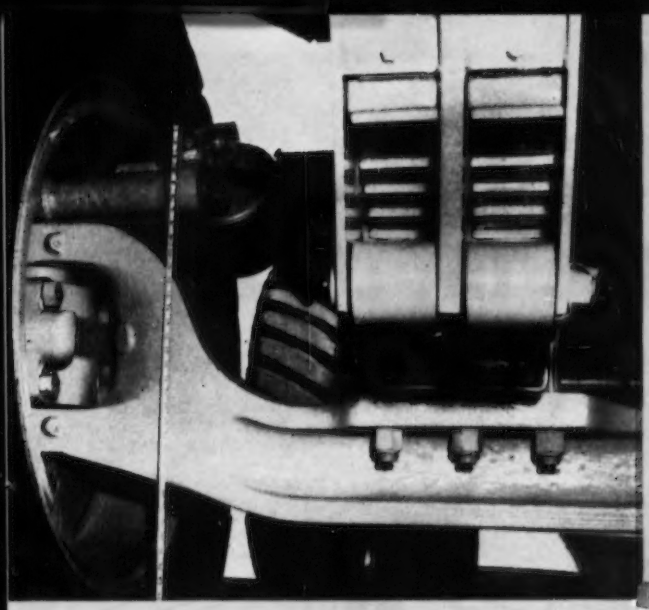
Acceptance by the oil company, says one spokesman, was dependent upon a number of features of the new can. It is light, so freight charges are lower; it takes brightly colored printing inks and is attractive; it is redeemable by the service station operator for a small refund and therefore will prompt him to return it and not let old rusty cans accumulate around his station.

Latter feature reportedly is one of the major public relations concerns of the major oil companies. A cluttered service station, they feel, can injure the public impression of the company. New can is crushed in a special machine by the station operator and returned.

Geochemistry Find Is Confirmed by U.S. AEC

DISCOVERY of uranium by geochemical methods has been announced by Geo-Resource Corp. and verified by the AEC at Spokane, Wash. Find was made through a DMEA-Geo-Resource project in the Blue Mountain area north of the Spokane Indian Reservation. Firm had previously proved its alluvial soil testing method on the known find of Dawn Uranium.

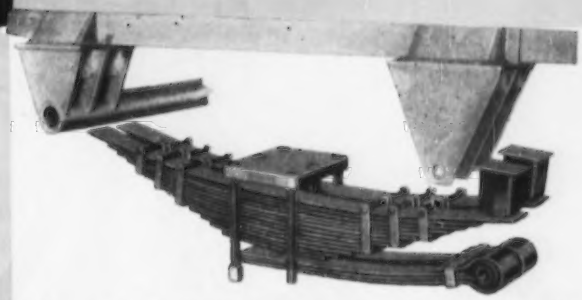
According to executive vice-president Richard Weaver, AEC radiometric assays of the rock indicate a uranium content of 0.13% within four ft of the surface. Company geologists report the mineralization was discovered in a laminated schist several hundred feet from the nearest granite contact. It occurs as

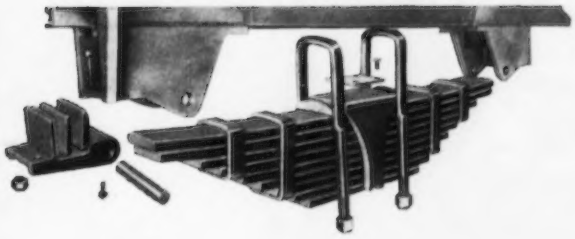


Variable rate front springs in the Kenworth 803 are typical of the specialized engineering which makes Kenworth's complete line of rock and ore movers so outstanding. Rubber-mounted at both ends, the dual springs have steel seats, adjacent to the rubber pads, that shorten their effective length under load. The result is shorter, stiffer springs to compensate for the additional load. Unloaded, the truck rides on rubber. The spring-type radius rods provide positive positioning of the front axle with full flexibility.

spring mounted

FOR COMFORT—LOW OPERATING COST





Rear springs on the 803 add to Kenworth's record of low maintenance, reduced tire cost, greater riding ease. Stiff rear springs are securely mounted in rugged frame brackets and positioned by use of steel and resilient pads. A spring shroud holds the leaves in alignment. Kenworth engineering proves...

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New 12-Yard Page Dragline at Marriott-Reed Coal Company, Columbia, Mo., Uses Westinghouse Generator and Two Motors to Swing 360-ton Dragline Every 45 Seconds.

A production jump from 800 to 1,000 tons of coal per day . . . that's the kind of service Marriott-Reed is getting from its new Page Dragline equipped with fast-responding Westinghouse swing motors and generator.

Operating around the clock in all types of weather, one Westinghouse direct-current generator drives two heavy-duty swing motors totaling 312 peak horsepower. By maintaining swing cycle of 12 cubic yards every 45 seconds, 18,000 cubic yards of overburden . . . soapstone, clay and shale . . . are efficiently and profitably removed every 24 hours, with no downtime or work stoppages.

This is just one example of the proven dependability, ruggedness and durability of Westinghouse motors and generators. For more information, call your Westinghouse Sales Engineer. Or write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

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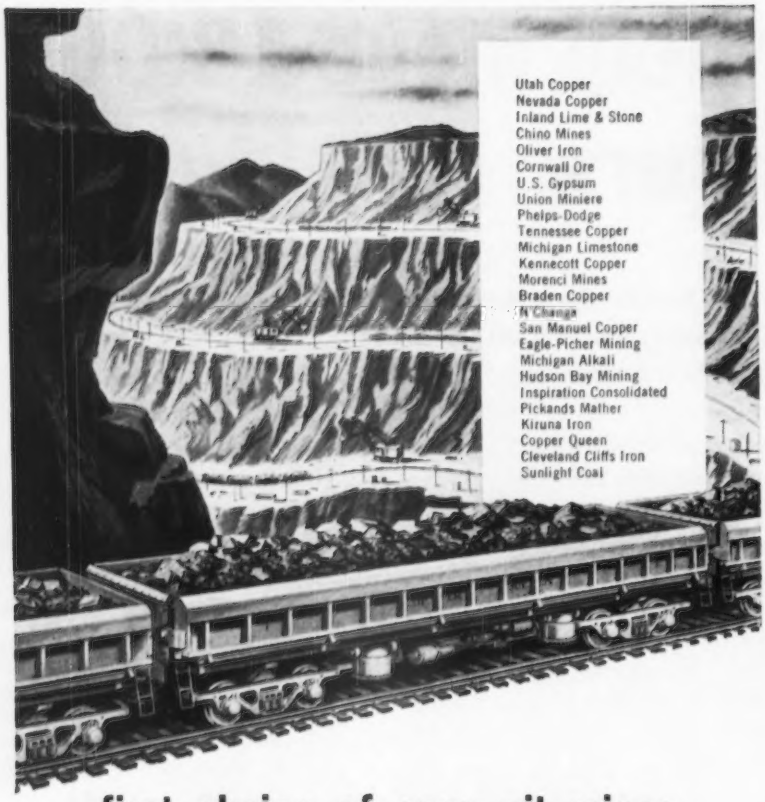
This is the special dual-circuit generator which powers the two heavy-duty swing motors on an adjustable voltage system. With this system, the motors can be instantly reversed by reversing the generator fields to maintain the 45-second swing cycle.

Western dump cars . . .



first choice of open pit mines

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- Fast acting dumping mechanism and steep dumping angle speed up operation, cut costs.
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- Body underframe is one all-welded unit heavily reinforced throughout to prolong car life.
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Geochemistry *(Continued)*

fracture fillings and coatings of autunite in a strong continuous system of Northwest trending fractures.

Union Carbide Plans Mexican Graphite Plant

A NEW GRAPHITE ELECTRODE PLANT being built near Monterrey, Mex. by Electrodos Nacionales, S. A., an affiliate of Union Carbide Corp., is scheduled to start production in 1958.

New factory will serve the electric-furnace steel, ferro-alloy and electrochemical industries, as well as provide materials essential to the nuclear power development of Mexico. Plant capacity will be capable of meeting Mexican requirements for these graphite products for a number of years to come. It is anticipated that a portion of the production will be exported, thus improving Mexico's foreign exchange position.

New Boron Refinery Will Boost U.S. Output 30%

AMERICAN PRODUCTION of boron will be increased 30% with the opening on Nov. 14 of the new U. S. Borax & Chemical Corp. open pit mine and refinery at Boron, Calif.

This $20-million project, which has required more than two years to complete, will produce approximately 70% of the free world's total supply.

The new operation represents the first time borax has ever been mined by the open pit method. The huge 175-ft-deep pit from which 9-million tons of earth has been removed, exposes the largest deposit of sodium borate known in the world and permits virtually a 100% recovery of ore.

More than 2,000 employees and guests from all parts of U. S. and abroad are expected to attend the opening and dedication ceremonies when the plant is formerly inaugurated. James M. Gerstley, president of the company, and top ranking government officials will participate in the program.

Lake Nordic Starts

THE FIRST of three Northspan Uranium Mines holdings at Blind River has started production of 2000 tpd, with 4000 tpd expected by year end. Lake Nordic started production in late October and expects to be joined by Spanish American (2000 tpd) in the spring of 1958, and Panel (3000 tpd) by the first of the year.

Military Demand Cut

DEFENSE requirements of metals for the first quarter of 1958 will be reduced, according to Office of Defense Mobilization. Allocations of basic metals to be set aside for military use, under the new economy cuts will be 7% smaller for aluminum and copper, and down

Illustration from Agricola's De Re Metallica (1621)

only the richest ores could be processed

Back when they had to be processed by hand, only the richest ores were refined. For—even though manpower was practically free—the methods were so crude that too much of the valuable metal was lost.

Today, ore bodies that were ignored only a few decades ago are being processed profitably. This is due in large part to efficient grinding mills that turn out many tons of properly sized ore every day . . . mills that often utilize CF&I Grinding Balls and Rods. Always made from special analysis steel with the ideal balance between toughness and hardness, CF&I Grinding Balls and Rods assure optimum grinding ability and maximum wearability.

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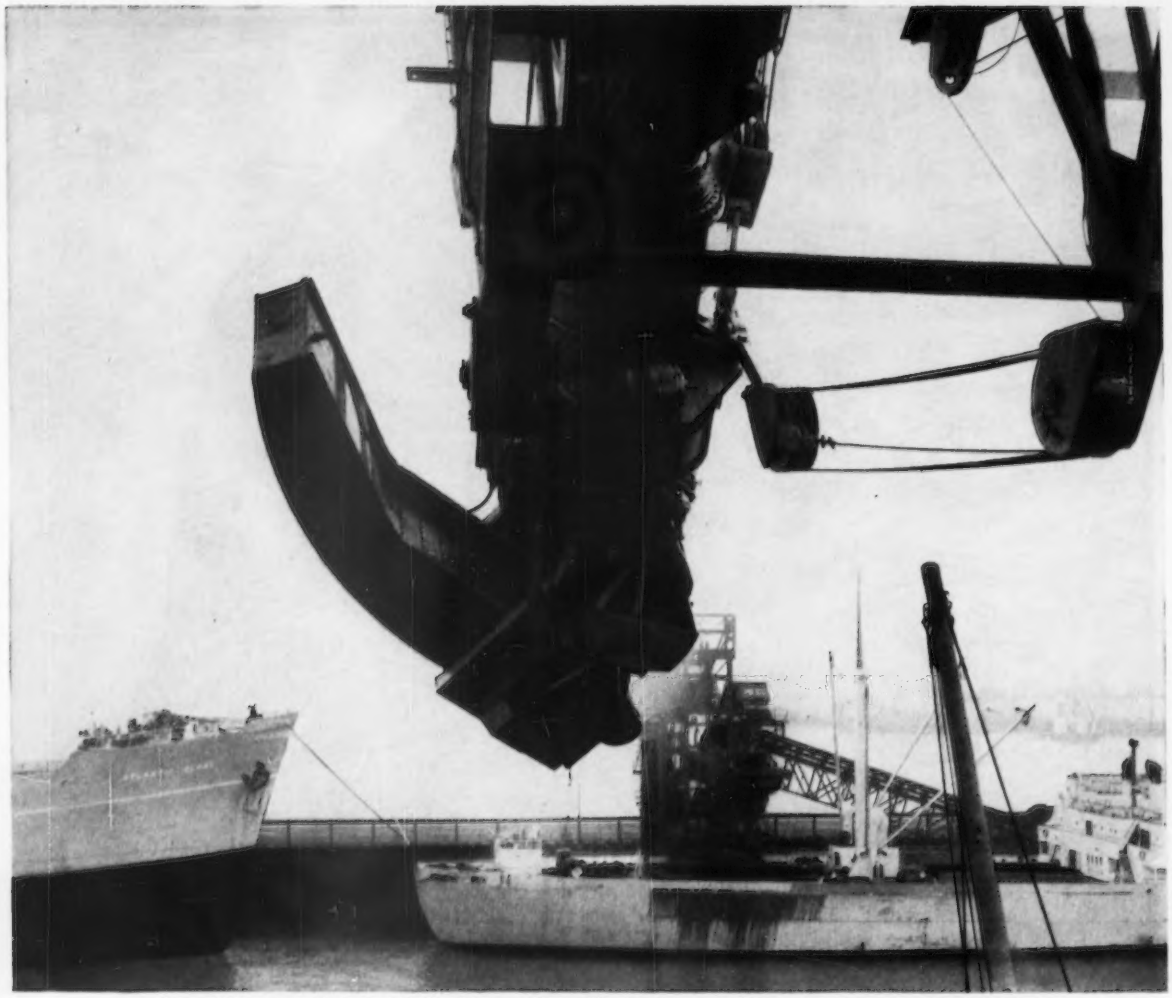

At world's most modern coal docks, Newport News, Va., C&O uses coal trimmers of Lukens "T-1" Steel.

New Coal Loading Machine is tougher and lighter—made with Lukens "T-1" Steel

TRADEMARK

Tough, weight-saving Lukens "T-1" gives this trimmer added mobility.

When the C&O Railway designed this huge new coal trimmer, they chose Lukens "T-1" steel for its combination of high strength and toughness—plus ready workability. Construction required less steel, produced outstanding abrasion resistance.

Now with stepped up efficiency, this mammoth machine easily and economically deposits 2,000 tons of coal an hour deep in the holds of ships—with a minimum of wear and maintenance.

Whether you handle coal, stone, gravel or metal ores, Lukens "T-1" steel used in areas hardest hit by punishing abrasive impact will save you money, too. It has tripled the life of rock driers. The 321 minimum Brinell quality has been known to outlast previous metals by 18 to 1 in quarry wear plates. Chutes, hoppers, and mine cars are other typical applications.

And Lukens "T-1" steel retains its remarkable toughness at temperatures well below zero. Send for our informative illustrated booklet, "Lukens 'T-1' Steel." Write Manager, Marketing Service, Room 959, Lukens Steel Company, Coatesville, Pennsylvania.

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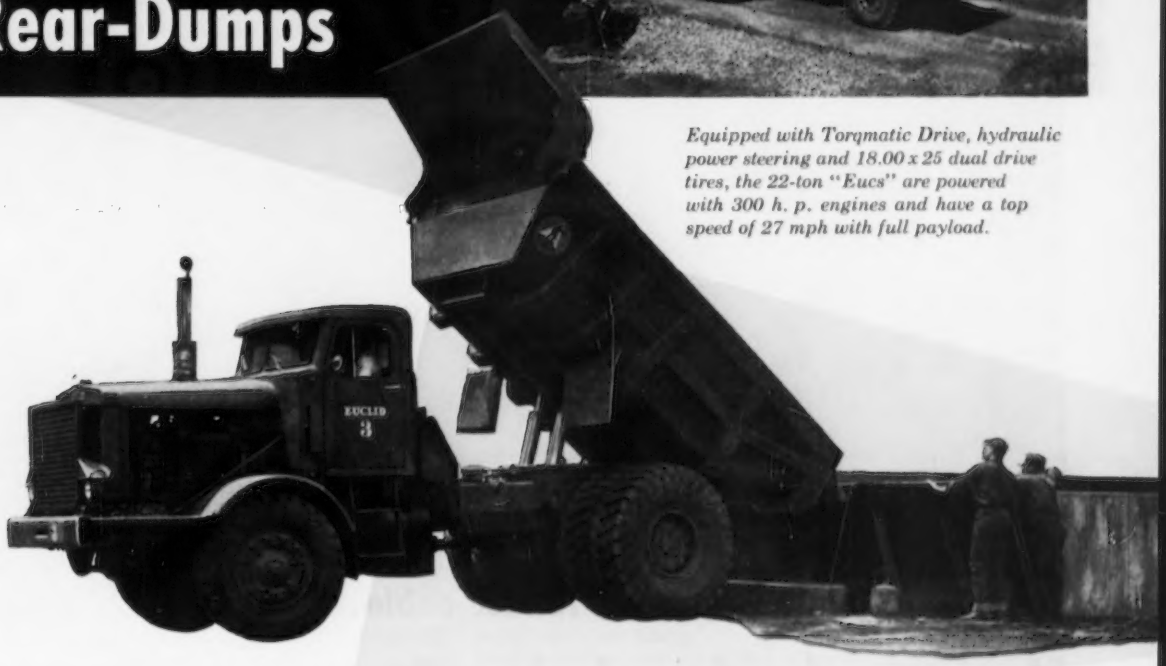

Equipped with Torqmatic Drive, hydraulic power steering and 18.00 x 25 dual drive tires, the 22-ton "Eucs" are powered with 300 h. p. engines and have a top speed of 27 mph with full payload.

Five Euclids haul 2500 tons of rock daily for Dragon Cement Co.

Steady production is maintained at Dragon Cement Company in Northampton, Pennsylvania with a haulage fleet of six 22-ton Rear-Dump Euclids. Simple, rugged construction and a thorough preventive maintenance program have enabled these reliable haulers to post an 87% availability record. Depending on production requirements, four or five of the "Eucs" work an average of 6 hours per day each, with either one or two held for standby service.

Assistant Plant Manager F. J. Anderson reports that the Euclids are loaded by two 2½ yd. shovels and haul an average of 2500 tons of cement rock daily to the dumping spot over a mile away. Loads are dumped into the 35-ton hopper in 30-45 seconds. Total time for the 2¼ mile trip from loading shovel to hopper and return averages 11 minutes.

The dependable performance of "Eucs"—job-proved on hundreds of mine, quarry and industrial operations—results in more work done at lower cost per ton. Your nearby Euclid dealer will be glad to provide you with facts and figures on the complete line of Euclid earthmoving equipment... and show you why ***Euclids are your best investment.***

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Euclid Equipment

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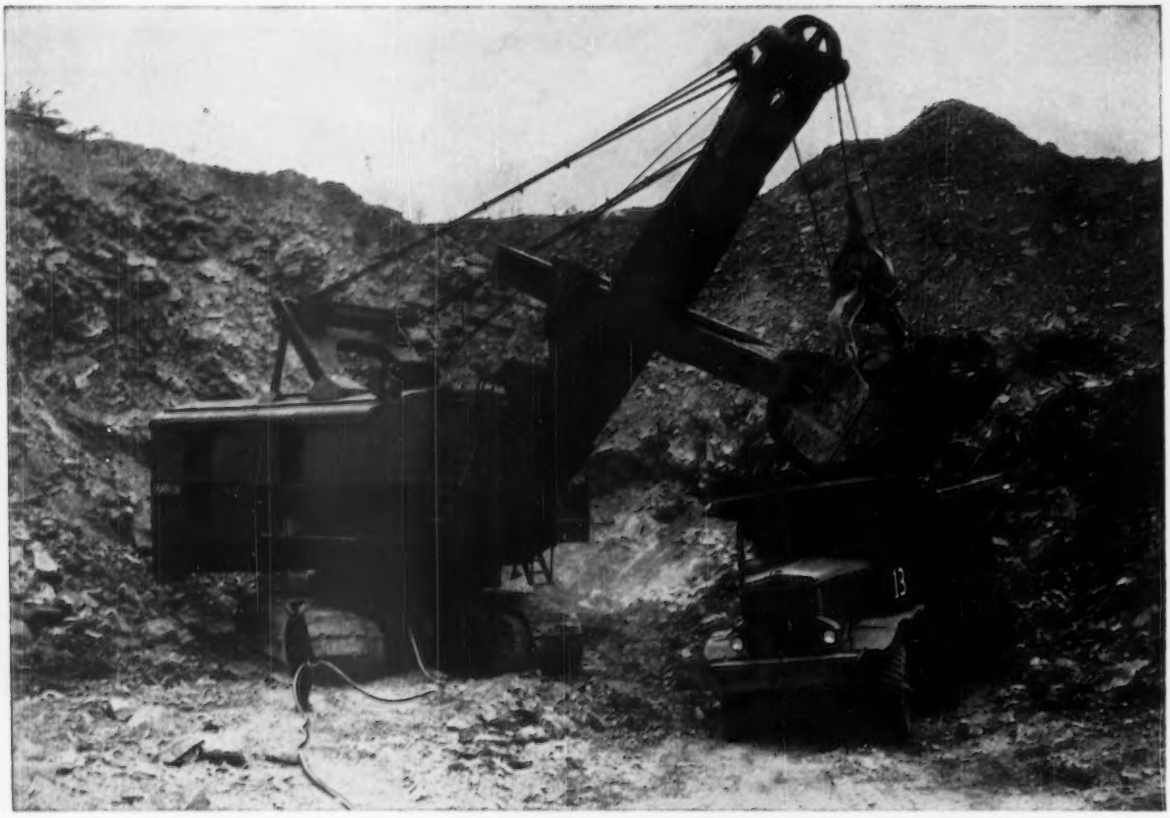

When choosing your shovel feeder cable...

How much of a choice do you really have?

HIGH RESISTANCE TO MOISTURE is just one of the benefits you get with Rome's portable shovel cable. This tough cable—available with *both* oil-base and butyl-base insulations—provides long-life service under the most severe conditions.

Shovel cable may *look* alike . . . but you can find as many differences in cable as you can in mining operations. And your particular kind of operation deserves the one best cable.

That's why it's so important to choose your Type SH-D cable from a manufacturer who can offer you an unbiased recommendation as to the proper insulation for your own application.

Your choice of insulations. Rome Cable is one of only three major companies now making *both* butyl-base and oil-base insulations. This means you can describe your mining conditions to a Rome representative and get the one *right* insulation for your feeder cable. No matter what you want most in your cable—maximum resistance to heat, moisture, or ozone resistance—you can be sure of your choice when the cable is made by Rome Cable.

Tough jacket, too. Feeder cable takes a beating in most open pit mines, so you naturally want to choose a cable that's tough. Rome's mold-cured Rome 60 (neoprene) jacket provides maximum resistance to abrasion and crushing . . . and it's ideal for use in either wet or dry locations.

Choose carefully. No matter what type of shovel cable you need, take advantage of Rome's ability to offer you a *real* choice of insulations. When you present your shovel cable problems to your nearest Rome Cable representative, you can be sure he'll recommend the *right* cable—not just the best his company can provide. Contact him for more information—or write to Department 530, Rome Cable Corporation, Rome, New York.

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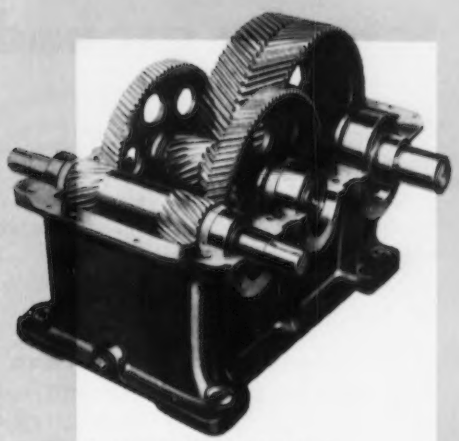
why these **10** outstanding features of *WESTERN GEAR* speed reducers are important to you!



- Double helical hardened steel gears, symmetrically arranged, provide balanced loading and long life.
- Better than average overhung load capacity.
- Heavy duty antifriction bearings assure greater than standard bearing life.
- Engineered to prevent oil leakage.
- Pinions integral with shaft for maximum strength.
- Rugged, rigid, ribbed housings.
- Simple, trouble-free splash lubrication system suitable for reversing service.
- High efficiencies: triple reduction efficiency 96% or better; single reduction efficiency 98% or better, at full load.
- Rated in accordance with AGMA standards.
- Backed by Western Gear's reputation and the experience gained in 69 years of designing and manufacturing power transmission equipment.

Western Gear speed reducers, with the "10 outstanding features" listed above, are available to you in a full line with ratings to 10,000 HP, in any desired ratio. Shaft arrangements in horizontal or vertical parallel shaft, in-line, or right angle with horizontal or vertical shaft. Western Gear's complete family of mechanical power transmission products PLUS skilled application engineering service promise you the right answer whether you are building an entire installation or modernizing old equipment. Call your "Western Gear Man" for the answers.

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Send me Speed Reducer Catalog 5402.

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out of the factory into the ground . .

and a champion every foot of the way

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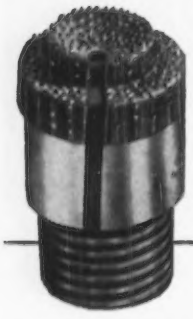

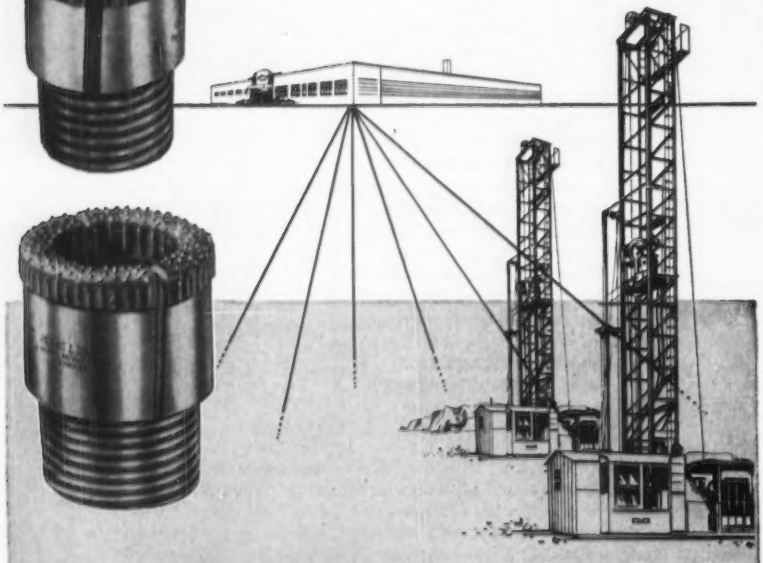

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Set-asides *(Continued)*

for nickel alloys. Aluminum consumption will be 8-million lb less, copper 3-million lb less, and nickel alloys down 44,000 lb.

AFN, Inc. Formed

A NEW COMPANY which will participate in the Government's high energy fuel program has been formed by American Potash & Chemical Corp., Food Machinery & Chemical Corp. and National Distillers & Chemical Corp. New firm, AFN, Inc., has an Air Force contract to develop boron-based fuels.

IN THE U. S.

ALASKA

P. R. & H. Mining Co. has moved the scene of their operations from the Circle District, where they have mined for several years, to the Gagnon ground in the Peters Creek area of the Talkeetna country.

Kenai Chrome operation was suddenly shut down for the winter by a heavy rain which washed out their road. Heavy snows on Red Mountain usually halt the operations early in the fall and it was therefore decided not to repair the road for the short time left this year.

Mannie Olson and Andrew Anderson have moved from Wolf Creek to Fish Creek in the Fairbanks district. The ground has been leased from the USSR&M Co., which held it for dredging for many years, but increasing costs have prevented production. Creek will now be mined with a dragline-bulldozer operations.

After years of litigation, it's now expected that drilling will proceed next spring on the Yakobi Island nickel deposits.

CALIFORNIA

Homestake Mining Co., San Francisco gold-mining firm, has undertaken public financing in order to raise money for its uranium ventures in New Mexico's Ambrosia Lake area.

The firm placed on the market $7-million in 12-year sinking-fund debentures and $5-million in 15-year debentures that can be converted into Homestake stock.

Homestake-New Mexico project includes a 750 tpd mill near Grants. Under construction by Western-Knapp Engineering Co., the $5,325,000 mill is to be finished by January.

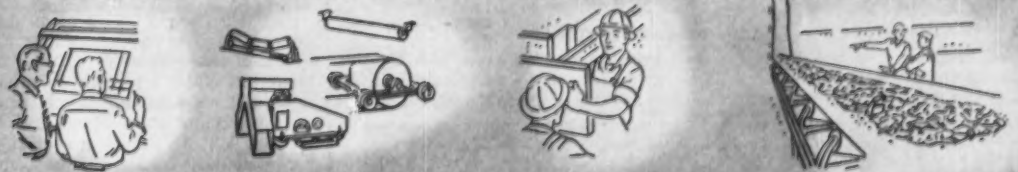
Atomic Energy Commission has signed a contract for purchase of up to 6.3-million lb of U_3O_8 concentrate up to March 1962.

Rio de Oro mine, principal source

WHAT BUT A BELT CONVEYOR could carry this load for so few pennies a ton?

Moving at high speed—24 hours a day if required—belt conveyors handle huge tonnages in a continuous stream. Loading and unloading delays are eliminated, and there's no time lost on empty return runs. Operating costs are relatively low, based on cost per ton handled. In fact, economies of belt conveyor operation and upkeep generally top any other form of bulk material transportation. And thanks to their extreme flexibility, installation is easy even in difficult locations.

WHO BUT LINK-BELT offers such a complete belt conveyor service? For any requirement—new installation or modernization job—Link-Belt will plan it, equip it, erect it and stand behind it. Our engineers can choose from industry's most comprehensive idler line—plus a broad range of pulleys, drives, terminal machinery and auxiliary equipment. Because all drawings and equipment come from one source, responsibility is centralized . . . no need to waste valuable engineering man-hours coordinating drawings from several sources.



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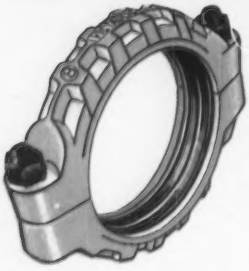
VICTAULIC HAS EVERYTHING...



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Simple, fast, reliable. *Styles 77, 77-D*, for standard uses with steel or spiral pipe, — *Style 75* for light duty. Other styles for cast iron, plastic and other pipes. Sizes ¾" to 60".

ROUST-A-BOUT COUPLINGS
For plain or beveled end pipe *Style 99*. Simple, quick, and strong. Best engineered and most useful plain end coupling made — takes a real "bull-dog" grip on the pipe. Sizes 2" to 12".

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The new, boltless, speed coupling, *Style 78*. Hinged into one assembly for fast piping hook-up or disassembly. Hand locks for savings in time and money. Ideal for portable lines. Sizes 1" to 8".

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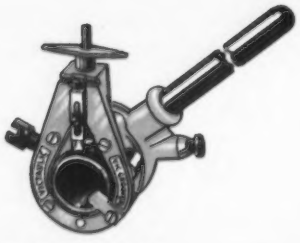
Elbows, Tees, Reducers, Laterals, *a complete line*—fit all Victaulic Couplings. Easily installed — top efficiency. Sizes ¾" to 12".



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VICTAULIC COMPANY OF AMERICA
P. O. BOX 509 • Elizabeth, N. J.

California *(Continued)*

of supply for the mill, is now producing ore that is being stockpiled at the mill site. Rio de Oro is a partner.

California mineral production last year showed a $100-million increase over 1955, a Bureau of Mines report discloses.

Total production hit $1,558,779,000, compared with $1,457,554,000 in 1955.

Of the 1956 total, petroleum and natural gas products account for $1.15-billion.

Biggest increase in tonnage came in the nonmetallics category—especially sand and gravel, boron minerals, and stone.

California continued to lead the nation in production of sand and gravel, magnesium compounds from sea water, and mercury.

Defense Minerals Exploration Administration recently certified that "discovery or development from which production may be made has resulted from the exploration work" at Coso Uranium, Inc., claims 10 miles east of Olancha in the Coso Range of Inyo County.

The certification comes as a result of exploration carried on after the DMEA granted the Coso company a $30,725 loan. Dated Aug. 21, 1956, the loan contract was the first to be granted for uranium exploration in California.

The company is proceeding with plans to construct an upgrader on its property, company officials announced.

Miners and prospectors are preparing a formal protest against establishment of a wild life game management area in western Kern County and eastern San Luis Obispo County.

Meeting in Taft, interested protestants elected Robert Kirkpatrick, L. L. Curyea, Irvin Geeslin, Earl Hummer and Robert I. Fiscus to a committee to draw up a formal protest to the U. S. Fish and Wildlife Service. Being protested are plans that would close the area in question to further mining locations. The mining land is part of a 115,472 acre tract being considered as a management area.

Miners say they have spent more than $100,000 to prospect and develop claims in the area. They point out that the area is rich in uranium and other ores along the foothills of the Temblor Range from Maricopa to Blackwell's Corner.

Officials of Beta Mining Co. are hoping that the development of refining equipment will make it possible to profitably mine bog uranium ore on 900 acres of company claims above Huntington Lake.

Value of the ore in the claims has been estimated at $15-million, company spokesmen say. J. C. Lackey, Brooks Mann and E. E. Bartlett of Taft and Mr. and Mrs. LeRoy E. Carlton of Fresno are shareholders in the company. AEC has expressed interest in the claims, owners say.

Idaho-Maryland Mines Corp., owner of idled gold and tungsten properties at Grass Valley, has embarked on a diversification policy.

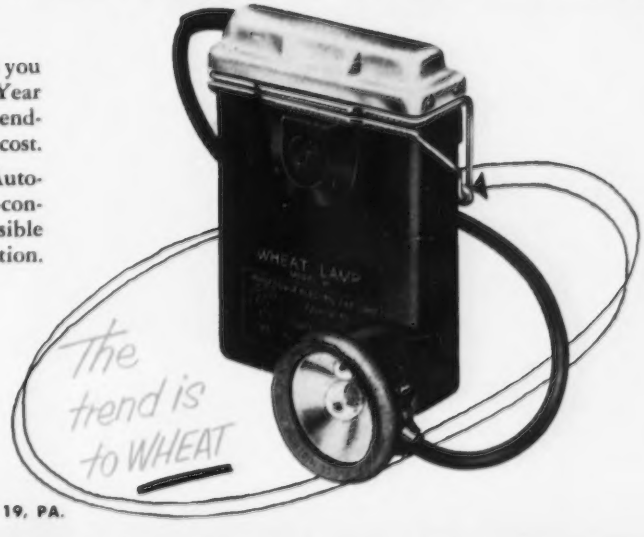
IN TODAY'S LIGHT FOR THE MINER—

The dollar you pay for **performance** *buys an outstanding value with* **WHEAT**

When you install WHEAT Electric Cap Lamps you get *continuous, high-level lamp performance.* Year after year, WHEAT gives you more light, dependable light, with less maintenance and at lower cost.

Development of the WHEAT all-metal Automatic Charging Rack with its electronically-controlled, selenium-disc rectification makes possible further savings through fully automatic operation.

Why not investigate!



National Mine Service Company

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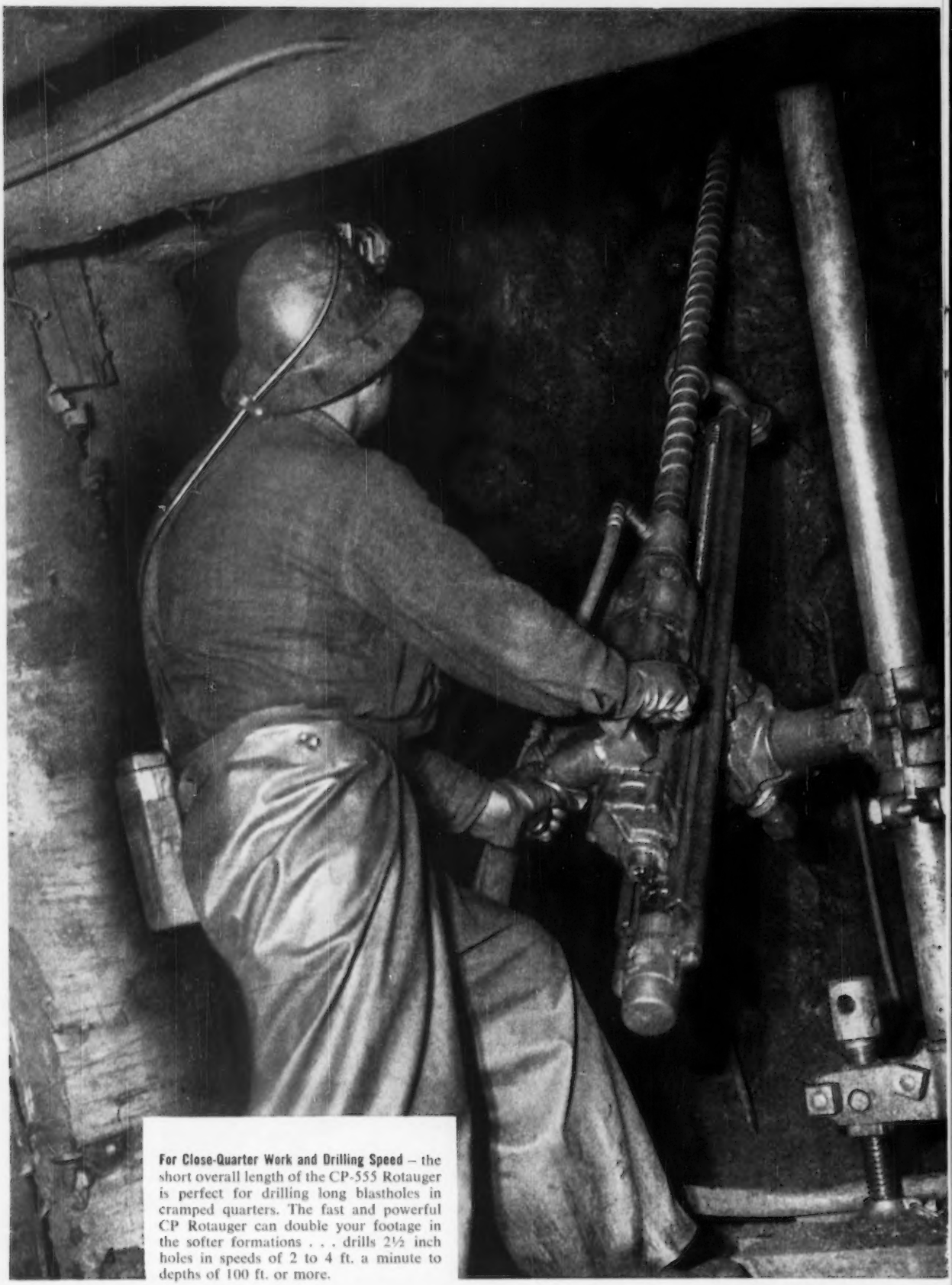

For Close-Quarter Work and Drilling Speed – the short overall length of the CP-555 Rotauger is perfect for drilling long blastholes in cramped quarters. The fast and powerful CP Rotauger can double your footage in the softer formations . . . drills 2½ inch holes in speeds of 2 to 4 ft. a minute to depths of 100 ft. or more.

There's a CP drill for every mining need!

For Complete Versatility – CP Integral and Attachable Airlegs teamed up with Chicago Pneumatic Sinkers get the most out of tungsten-carbide bits. The Attachable type is ideal for mounting standard sinkers for intermittent or production drilling; the Integral type is designed primarily for production drilling . . . both models in standard feeds of 36" and 48".

For Blast Hole and Exploratory Drilling – the powerful, lightweight, easy-to-handle CP-55 Diamond Core Drill is faster than any other diamond drill in its class. Has a highly efficient CP Rotary Air Motor . . . requires a minimum of air per foot drilled. Conservatively rated at 500 feet with E Rods and EX Fittings. Skid mounted types are available for test borings . . . rated in capacities to 2250 ft.

For Stoping and Raising – the CP-34 Stoper has just-the-right combination of piston speed, foot-pound blow, rotating speed and feed-leg pressure to achieve that extra long service and performance from tungsten-carbide bits.

Chicago Pneumatic *8 East 44th Street, New York 17, N. Y.*

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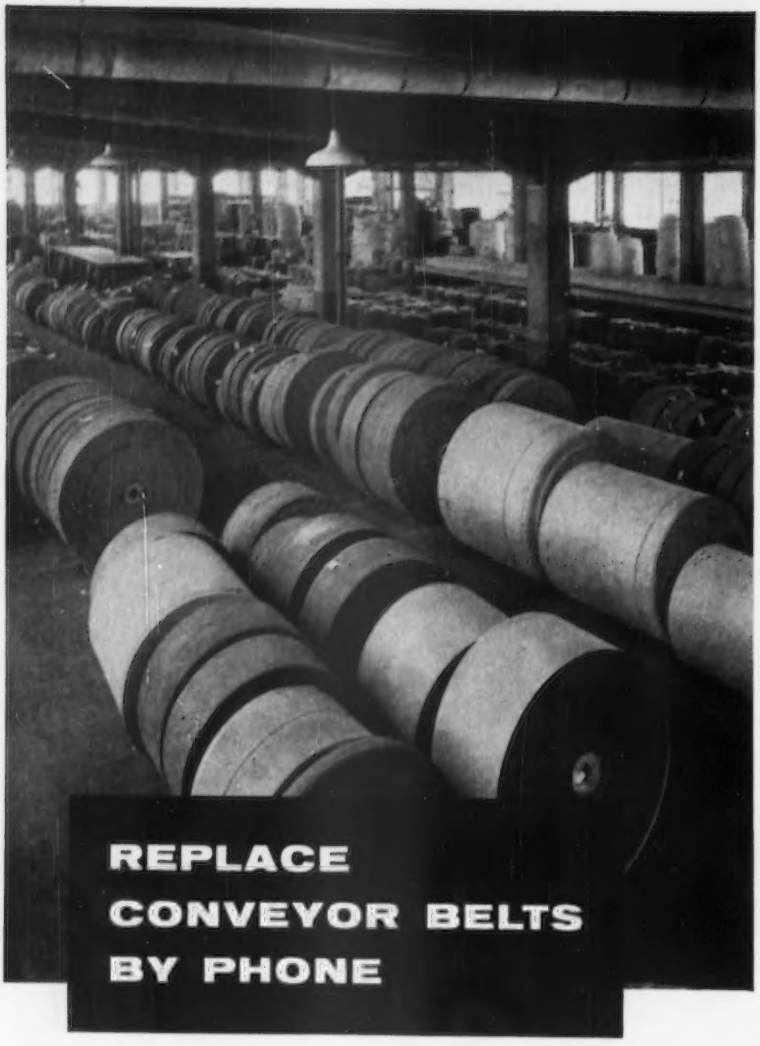

In nation-wide stock for immediate delivery are H-R conveyor belts in sizes and grades for virtually every service. Orders placed by phone are processed the same day in the H-R warehouse nearest you to assure fastest shipment.

Available from stock are: *Maltese Cross*—for severest, heavy-duty handling of trap rock, stone, ore, etc.; *Ajax*—for general use such as conveying coal, sand, gravel, crushed stone; *Conservo*—for moderate general service with economy; *Monarch*—for special applications requiring resistance to oils and chemicals.

Breakdown service? When non-standard belts are needed *fast*, as a result of a breakdown, Hewitt-Robins can ship special, factory-built belts within one week or less! To order the type and size best suited to your requirements, call your nearest H-R representative, or Hewitt-Robins, Stamford, Connecticut.

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CONVEYOR BELTING AND IDLERS . . . POWER TRANSMISSION DRIVES
INDUSTRIAL HOSE . . . VIBRATING CONVEYORS, SCREENS & SHAKEOUTS

California *(Continued)*

Stockholders approved acquisition of Schroeder Manufacturing, Inc., Long Beach manufacturer of valves and other accessories for the aircraft industry.

The transaction involves $425,000, including 400,000 shares of Idaho-Maryland stock at 50c and assumption of Schroeder's debts amounting to $225,000.

COLORADO

T. R. Llewellyn of Denver, vice president of the Westminster Corp., told stockholders in a recent letter that the company has purchased the leases of 12 uranium mining claims in the Slick Rock Mining District of Montrose county, from the Fritz-Erickson Mining Co. of Dove Creek.

August gold receipts at the Denver mint were down to 53,597 oz worth $1,875,911 this year from 62,553 oz worth $2,189,375 in 1956. Silver receipts, still adversely affected by the relatively high world price, were down to 12,862 oz worth $11,638 from 584,452 oz worth $528,938.

Outlook for lead and zinc miners in the U. S. appears brighter. The U. S. tariff commission may take favorable action soon on requests by the lead-zinc industry for relief under the Reciprocal Trade Act, the Colorado Mining Association believes.

Robert J. Palmer, executive secretary, disclosed this information in his report of legislative progress to 18 of the 40 members of the committee meeting at Durango. Palmer said he had received assurances President Eisenhower would ask the commission for a quick report after the hearings.

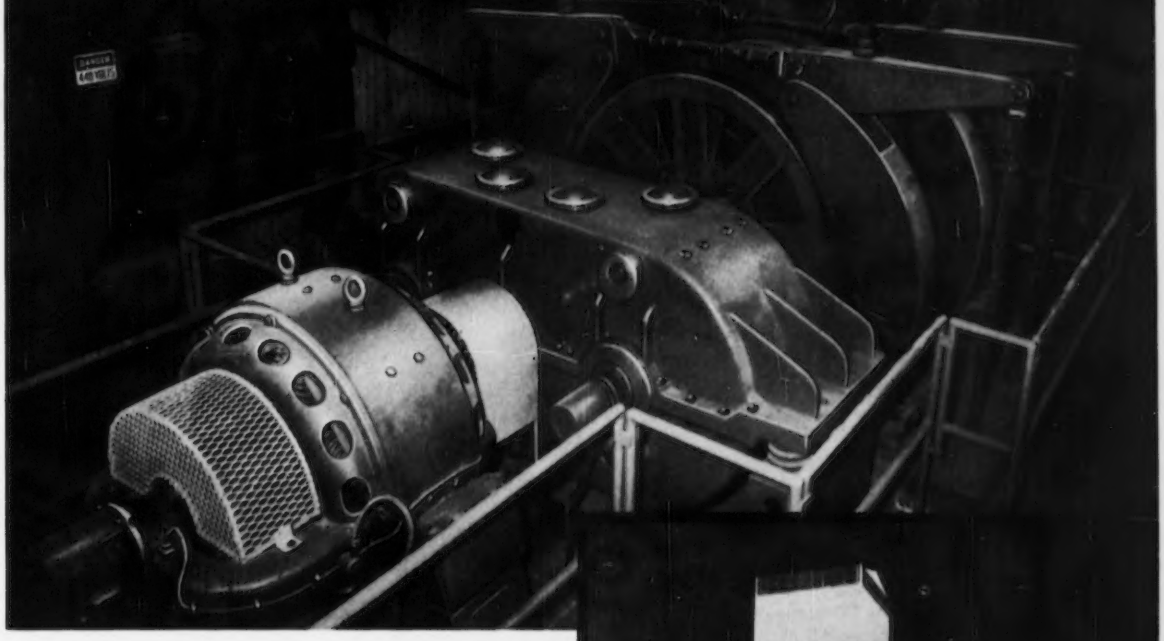
The secretary said the maximum that could be granted under the reciprocal trade agreement would be 2.55c per lb on lead and 2.1c per lb on zinc. Present tariff levels are $1\frac{1}{10}$c per lb on lead and $\frac{7}{10}$ of a cent per lb on zinc.

Some rich samples of gold and silver ore have been taken from the Bessie G mine high in the La Plata mountains, it is reported in Durango. Assays of two specimens showed gold content up to 2,823.38 oz a ton, with the silver running to 1,572 oz. On such basis, the value for a ton of such ore would be nearly $100,000. Bessie G is owned by Zodomok Mines and is operated by Karl Goff and Donald DeLuche. The company has a reduction mill of 50 tpd capacity in La Plata canyon.

Wayne Walling of Farmington, N. M. and Joe Gamble of Ft. Worth, Tex., are reported to be opening the Auburn Tunnel near Silverton. Mine is a former gold-silver-lead-zinc producer.

Another old-time producer in the Silverton area is being prepared for more production. Walter Bentley is reopening the Kittimac mine at the head of Minnie Gulch. Diamond-drilling program was conducted on the property last year. The

NEW ASEA MULTI-ROPE FRICTION HOISTS INSTALLED BY NATIONAL POTASH



Once again, attention of American mining men has been focussed on the superior economy and safety of the new ASEA multi-rope friction-drive hoisting method.

Latest ASEA hoist installation has been made by the National Potash Co. at Carlsbad, New Mexico. Fully automatic in operation and loading, an ore hoist and a service hoist are mounted in two head frames. Skip load is 10 tons; maximum speed, 1,250 ft. min.; maximum depth, 1,850 ft.

An ever-growing number of ASEA hoists is being installed throughout the U. S. and Canada.

You will want to look into these ASEA advantages:

COST LESS TO INSTALL AND OPERATE

1. Smaller diameter and narrow width of pulley give low unit weights and reduced inertia.
2. Compact size and low weight permits installation in head frame above shaft.
3. Above factors result in lower initial capital and operating cost.

SAFER

1. Several parallel ropes are used instead of a single rope.
2. Safety wedges on shaft guides positively prevent overwind.

SAVE ROPE WEAR

1. Less rope wear due to elimination of fleet angle, absence of S-bends, and elimination of cross-overs which are used in multilayer practice.

Illustrated booklets on ASEA mine hoists are available on request.

ASEA equipment is sold and serviced in the U. S. by:

AROS ELECTRIC, INC.

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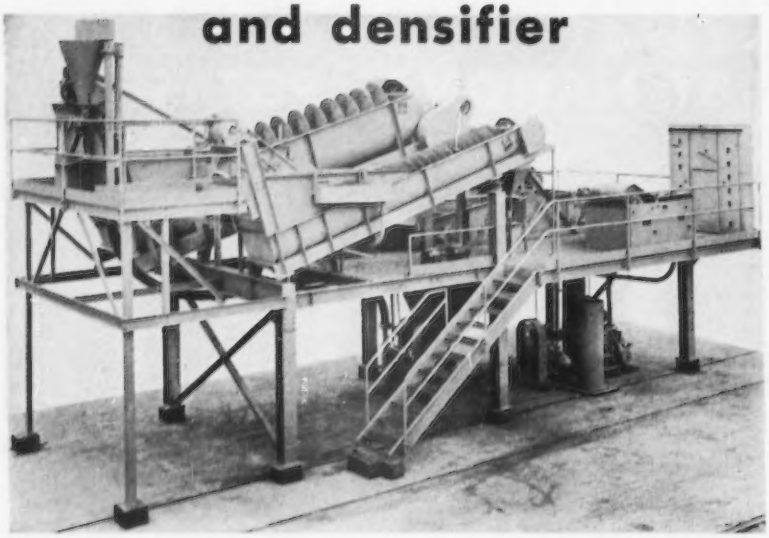
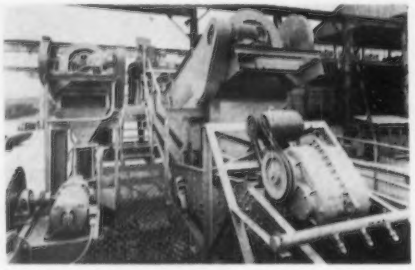
Prefabricated HMS plants with AKINS separator and densifier



Typical Akins 3-product HMS installation with Separator and Densifier. Note how Akins tank construction permits simple supporting structure. These Sweco-built plants are compact, simple in design, and convenient.

designed, manufactured, erected by Sweco

These prefabricated HMS plants are designed, manufactured and erected by the Southwestern Engineering Co., Los Angeles. Akins Separators were selected by Sweco because . . .



Media discharge end of Akins Densifier showing demagnetizing coil.

EXPERIENCE has proved these advantages of Akins

- Gradation of pool density from feed entry point to sink removal point provides natural cleaning of sink, and allows circulation of media at lower gravity and viscosity.
- Gradation of pool density also allows 3-product separation in one machine. Extraction of middlings requires only one media cleaning circuit.
- Start-up under full load, eliminates necessity of draining vessel after shutdowns.
- Variation in rate or grade of feed is not detrimental.
- Large pool area depth and volume minimize tramp refuse in the product and facilitate better recovery of values from fine sizes.

YOU can have all the advantages of Akins equipment AND the combination of mineral dressing and contracting experience offered by CIW and Sweco.

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COLORADO IRON WORKS CO.

1624 17th Street • Denver 2, Colorado

AKINS CLASSIFIERS • SKINNER ROASTERS • LOWDEN DRYERS

Sales Agents and Licensed Manufacturers in Foreign Countries

Colorado *(Continued)*

mine has shipped lead-copper, gold, and silver over the past years.

A new process has been developed by C. V. Stewart, chemist with the Clute Corp. of Rocky Ford, for separation and recovery of uranium. Stewart's invention leaches uranium from the ore by chemical action, cutting the present 60-hour time limit to about 60 minutes, according to Clute officials. Clute has another process for the dry separation of uranium from its ores.

Atomic Energy Commission in July released land in the Bull Canyon area located in a good prospect area south of Uravan, which has been producing uranium and vanadium ores. Golden Cycle Corp. succeeded in locating twelve claims in what is generally regarded as a "hot" area. "We expect in the near future to drill this ground and, if possible, prove up ore reserves sufficient to justify a sizable mining operation," says the company.

The 23-mile water tunnel being driven by Denver through the Continental Divide west of Denver to bring water from the western slope of the Rocky Mountains to Denver reservoirs may also bring the City and County of Denver new wealth from deep orebodies on the tunnel line.

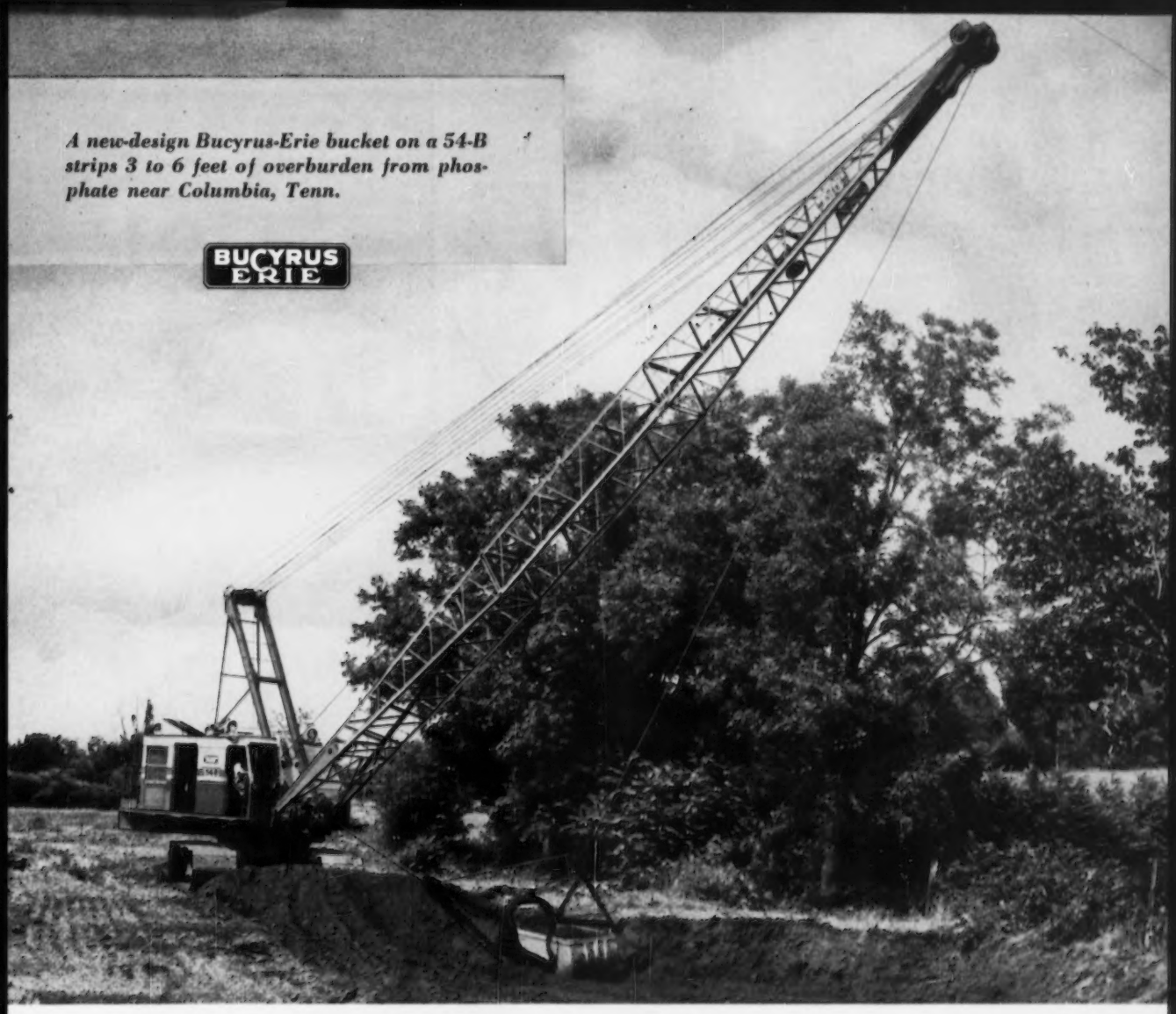
Climax Molybdenum Co. and the Denver water board have signed a contract under which the mining company will test the mineral content of rock excavated from diversion tunnel being driven through a mineralized section. There is a good possibility that paying quantities of gold, molybdenum and other ores may be found, according to Robert S. Millar, water board manager.

Golden Cycle Corp. of Colorado Springs has completed an agreement with Black Bear Consolidated Mining Co. whereby Golden Cycle will acquire a one-half undivided interest in the Potts Mine near Marysvale, Utah and other adjacent properties in return for completing a specified amount of exploration and development work on this property. Operation and management of this property was taken over Aug. 1 by the Golden Cycle. Production from this property is currently running at the rate of approximately 4,000 tpm.

Since acquisition of the Potts mine, Golden Cycle has purchased additional adjacent property and have options on other contiguous tracts. Its interests now total approximately 500 acres. With the new acquisitions, it may in the not-too-distant future be producing a minimum of 200 tpd ore from the area.

Biggest news in Silverton for some years is that the Shenandoah-Dives Mining Co. of Silverton and the Marcy Exploration and Mining Co. Inc. of Durango have merged to form the Marcy-Shenandoah Corp. The new firm will also control the Old Hundred and Garry-Owen properties in Silverton area's Cunningham Gulch.

Negotiations have been completed for construction of a $2½-million uranium



A new-design Bucyrus-Erie bucket on a 54-B strips 3 to 6 feet of overburden from phosphate near Columbia, Tenn.

BUCYRUS ERIE

Designed to Outstrip--Built to Outlast

BUCYRUS-ERIE NEW DRAGLINE BUCKETS

Big dragline output comes more easily when you are swinging an *all-new* Bucyrus-Erie bucket. Its weight is correctly balanced and teeth properly pitched to speed penetration of the cutting edge and thin "slicing-action" lip. Its tapered basket fills fast. Precise flaring and accurate balance minimize bobbing and spilling. Clean inside design of the basket and extra high arch assure clean, fast dumping.

These new buckets are made of BECOLOY, a new steel developed by Bucyrus-Erie metallurgists. BECOLOY has high impact and shock resistance even at low temperatures. Its great strength per pound lets you swing more payload, less deadweight every shift. Maintenance costs are low since BECOLOY can be cut with an acetylene torch and is readily weldable.

Bucyrus-Erie dragline buckets are available in a wide range of sizes for light, medium or heavy-duty service . . . with solid or perforated baskets. Call on your Bucyrus-Erie distributor . . . he'll gladly recommend the right bucket for your dragline and specific use. 25R57C

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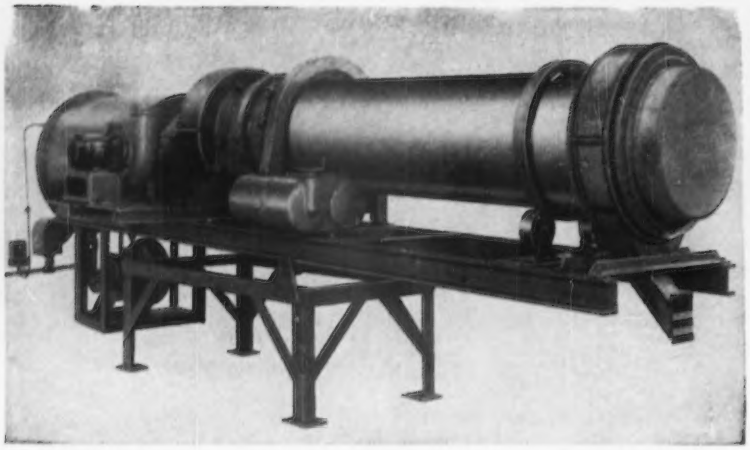
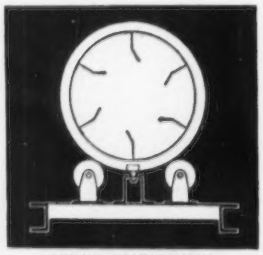


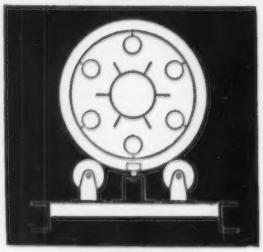
PILOT PLANT ROTARY DRYER

The Ruggles-Coles Pilot Plant Dryer is designed especially for laboratory use or for small capacity unit operations requiring a continuous or intermittent drying step. Each unit:

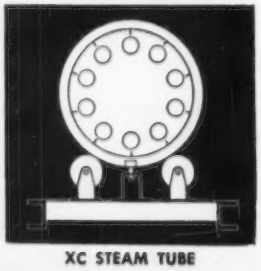
- Is mounted on a structural steel base.
- Has removable "knockers."
- Provides for easy changing of shell rotation speed or shell slope.
- Is available in stainless steel or other corrosion-resistant materials.
- Requires only fuel supply and power connections to be placed in operation.
- Is easily moved from place to place.



XH-XF SINGLE-SHELL



XB DOUBLE-SHELL



XC STEAM TUBE

It is available in three models:

(1) XH-XF single-shell, direct gas fired dryer. Arranged for either parallel or counter-flow operation. Bulletin AH-471.

(2) XB double-shell, indirect-heat, gas-fired dryer for drying without contamination. Volatiles removed with only limited dilution. Bulletin AH-472.

(3) XC steam-tube indirect heat dryer. Can be connected to any available steam supply or furnished with a 3-HP steam generator. Bulletin AH-473.

For complete information write Department 1.

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Colorado *(Continued)*

processing mill at Bedrock, Montrose county, according to Jack Turner of Moab, Utah, president of Atomic Fuel Extraction Co. Turner said agreement has been reached with his firm and James McGoodwin of Dallas, Texas, president of Nuclear Resources, Inc. The mill, Turner said, is one for which the Atomic Energy Commission granted a permit to Atomic Fuel Extraction Co. several months ago.

Agreement reached in Denver, Turner said, calls for the AEC mill permit to be transferred to Nuclear Resources Inc. on a merger basis. Engineering on the 250 tpd plant has been detailed by Western Knapp Co. of California. The firm will build and supervise shakedown runs on the new processing facility, Turner said.

IDAHO

Good grade of ore was encountered on the new bottom level of the Conjecture silver-lead mine near Lakeview, on Pend Oreille lake.

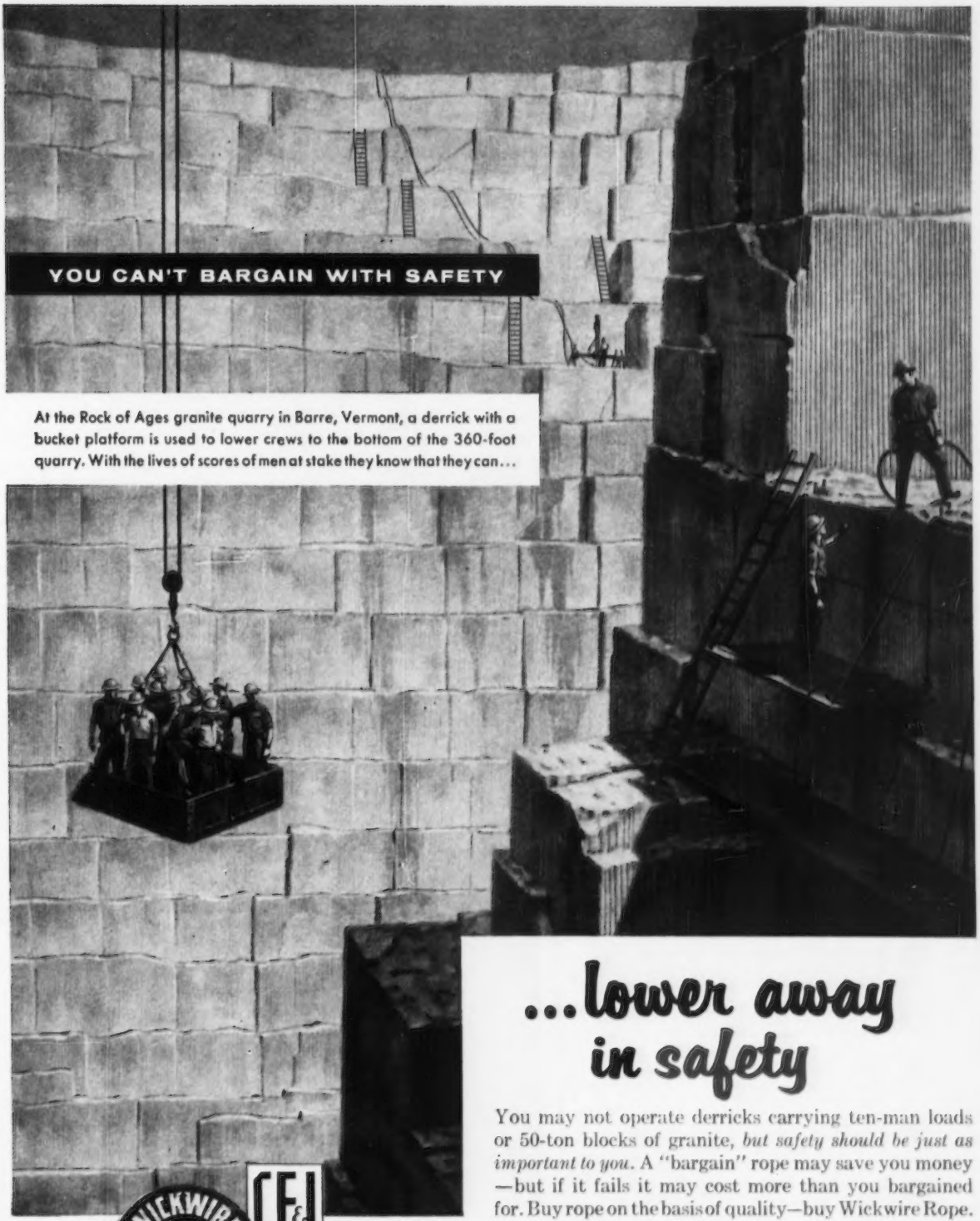
R. W. Neyman, president of Federal Uranium Corporation, Salt Lake City, said that crews have followed a vein 100 ft from the new 700 ft level shaft station about half the distance to orebody's edge as projected from the 500 level above.

Federal Uranium is developing the mine under a profit sharing agreement with Conjecture Mines, Inc., of Spokane. Federal Uranium officials said that some of the ore in the drifting is of commercial grade.

Production at Sunshine Mining Co.'s mine in Shoshone county during the first eight months of 1957 totaled 136,160 tons averaging 25 oz silver and 1.4% lead. This compared with 135,262 tons averaging 25.8 oz silver and 1.1% lead in the same 1956 period. President Robert M. Hardy, Jr., in a report to stockholders, estimated net income of $301,772 for the 12 months ended Sept. 30, compared with $587,659 for the previous 12 months.

Discovery of high-grade silver ore has been made at the Iron Mask Mine on Blacktail Mountain in Bonner County's Talache District. Selected samples from a vein found by George Watt, Robert Evans and Gerald Sarff have assayed more than 1000 oz silver per ton and a test shipment to the smelter ran 178.8 oz silver and 2.11% copper. Ore is predominantly tetrahedrite and occurs in a parallel structure vein about half a mile west of the rich old Talache vein which yielded more than $2-million worth of silver many years ago. Iron Mask Mining Co. of Sandpoint has been incorporated to explore and develop the vein, and an adit tunnel is now being driven to intersect the structure several hundred feet below the point of discovery.

Development work on the new Bonanza vein in the Dayrock Mine of Day Mines Inc., north of Wallace, is proving a



At the Rock of Ages granite quarry in Barre, Vermont, a derrick with a bucket platform is used to lower crews to the bottom of the 360-foot quarry. With the lives of scores of men at stake they know that they can...

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Idaho *(Continued)*

substantial orebody. By the early part of September the ore had been exposed for a lateral length of about 500 ft and a vertical distance of 250 ft.

On the 500 level, where the vein was discovered by diamond drilling early last May, a west drift has opened some 500 ft of ore which averages more than 20% lead and 6 oz of silver over a width of nearly 5 ft. A new 650 ft level drift shows somewhat less ore mineralization, but still in satisfactory commercial amounts. In the face of a raise up about 100 ft above the 500 sill, the ore is narrower but higher in grade.

Development work is continuing as rapidly as the various faces can be advanced.

Reappraisal of ore reserves at Hecla Mining Co.'s Radon uranium operation in the Big Indian District of San Juan County, Utah, has indicated substantially larger tonnages than originally estimated on the basis of drilling disclosures. Underground development has proven an estimated 500,000 tons averaging about 0.68% uranium oxide. Pre-production estimates ranged from 200,000 to 300,000 tons grading less than 0.5%.

Ore production from the property for the first eight months of this year amounted to 36,698 tons of 0.815% grade. Hecla's share (25% after royalties) of operating income was $376,838, after allowances for depletion, depreciation and amortization.

At the Silver Mountain project east of Mullan, a joint Hecla venture with the Bunker Hill Co., two exploration headings are in progress on the 2,000 level of the new shaft, one in a northerly direction and the other toward the west. The north heading, now in more than 2,000 ft, expects to open the Deadman's shear zone at about 4800 ft. The west lateral is paralleling the Paymaster zone, and diamond drills are being used to probe the zone from the lateral.

Shaft-sinking operations got under way early in September on the big silver vein in Vulcan Silver-Lead Corp.'s Galena Mine on Lake Gulch west of Wallace. An inclined winze from the 3400-ft level will be extended to the 4000-ft horizon. The vein has already been opened and partially developed from the 2200 to the 3400 levels. American Smelting and Refining Co. operates the property under a long-term lease agreement in which Day Mines Inc. has a 25% interest.

Eastern Star Mining Co., an old Wallace corporation which was reactivated about two years ago to investigate uranium possibilities in the Spokane area, has acquired a new base metal property near the Idaho-Montana divide east of Mullan, along the zone which is currently being explored at depth to the west by the Bunker Hill-Hecla Silver Mountain project. Company is also picking up oil leases in Idaho and Washington in anticipation of a drilling boom which is expected to develop out of Sunshine Mining Co.'s recent oil discovery near the Washington coast.

Metropolitan Mines Corp. is undertaking further development of the old Black Bear property on Canyon Creek northeast of Wallace, under an agreement with Black Bear Silver-Lead Mines Co.

Present work at the Black Bear consists of reopening and rehabilitating an additional 800 ft of the main adit tunnel to gain access to a vein structure in which ore was disclosed by diamond drilling in the Erin claim which the Black Bear company recently leased from Coeur d'Alene Syndicate.

Polaris Mining Co. has opened up a sizable new ore shot on the 2800 ft level of its silver Summit Mine in the silver belt of the Coeur d'Alene District southwest of Osburn. A west drift from the 64 raise at this horizon has exposed 270 ft of good commercial silver-copper ore.

In the Rainbow area, which Polaris is opening through its two-mile-long east lateral from the Silver Summit shaft, a raise on the 145 ft ore shoot found early this summer has been extended 80 ft upward in good ore. An east drift is being continued along a fault structure described as having "very interesting

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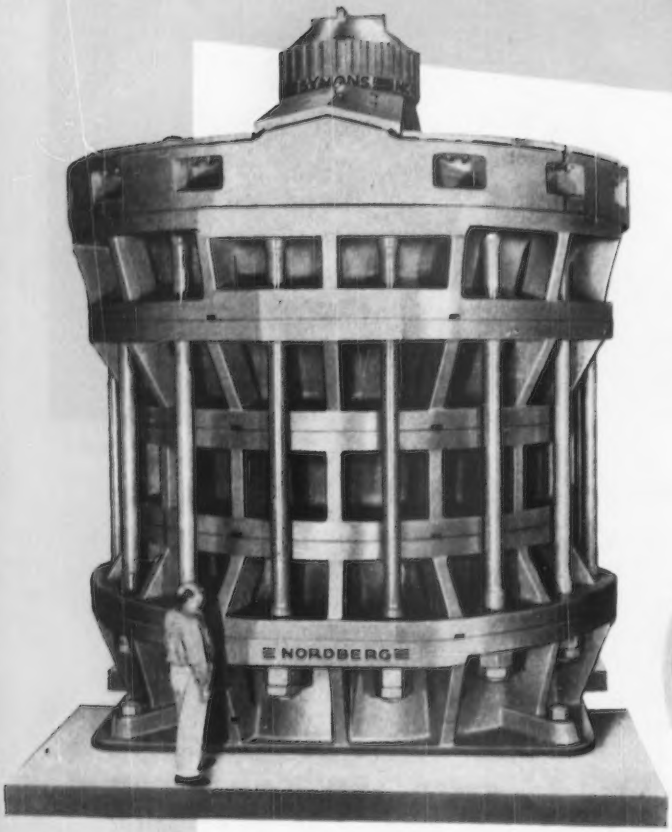

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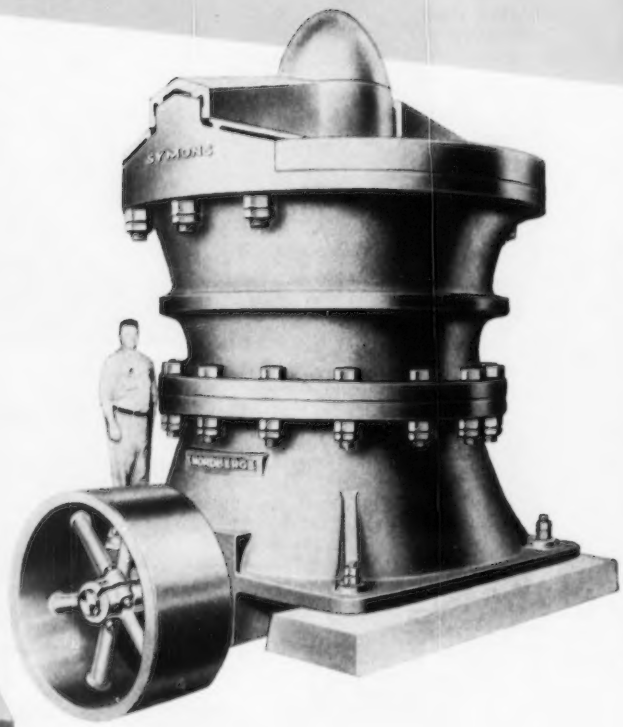

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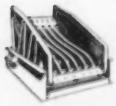

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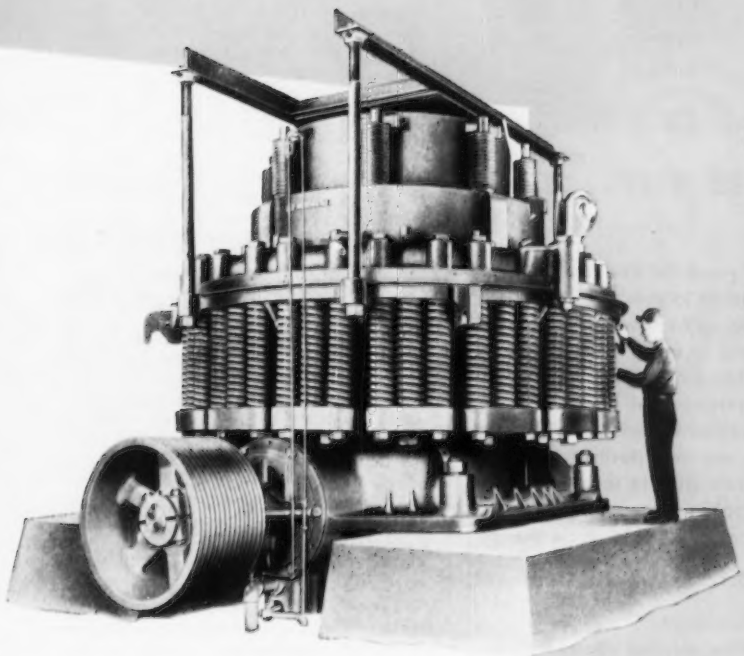

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Idaho *(Continued)*

characteristics" and has about 2,000 ft to go before it reaches east end line of the Rainbow Mining & Milling Co. property.

A state land board decision revoking the gold-dredging permit of Clearwater Dredging Co., owned by Vernon B. Finch of Spokane, has been reversed by the Idaho Supreme Court on the ground that the provision of the dredging control initiative passed in 1954 for appeal of land board rulings to the supreme court is unconstitutional.

The land board had revoked the permit about a year ago after extensive hearings on charges that the gold dredging operations on the Crooked River in Idaho County near Elk City had failed to keep the river waters "reasonably clear." Finch had appealed the decision, claiming the law was unconstitutional because it failed to set standards of "reasonable clarity."

Pilot Silver-Lead Mines Inc. has sold its property north of Mullan, including its lease on the Cincinnati group, to Abot Mining Co. for 1.3-million shares of Abot stock and is now planning to distribute the Abot shares to Pilot stockholders on the basis of one share of Abot for each three of Pilot. The purchase price also included 500,000 shares of Abot earmarked for settlement of all Pilot obligations.

The Abot firm, organized last spring by Day Mines interests and headed by H. L. Day, president of Day Mines Inc., is in the process of consolidating several properties in the area north of its Gold Hunter property, reportedly for exploration from a lower level of the recently-rehabilitated Gold Hunter shaft.

Bunker Hill Co. has reactivated its sand plant at Kellogg after a four-year shutdown.

Plant will process stockpiled nonmetallic rock to produce sand and concrete aggregate. These materials are needed for the concrete batch plant to be used in building additions to the Kellogg facility.

The stockpiled material is washed, screened and ground in a small ball mill. What little lead and zinc values remain are recovered from the slimes by feeding them through the flotation circuits of the Kellogg lead-zinc concentrator.

Operation of the sand plant was discontinued in 1953 when the company halted production of low-grade lead-zinc caving ore. Non-metallic content of the low-grade ore, separated in the sink-float section of the concentrator, had been used as feed for the sand plant.

Bunker Hill decided to reactivate the plant to provide building materials for the construction program to be undertaken over the next five years.

MICHIGAN

At mid-September Calumet & Hecla, Inc. decided to reduce the production of copper by suspending operations at some high cost mines and using as many of the

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Stripping 20 feet of overburden at a phosphate mine near Mt. Pleasant, Tenn. This TD-24 rolls full blades of topsoil and clay 150 feet — in only 40 seconds. The blade is an International cable 'dozer. Owner of the outfit: Rochelle and Collison, Mt. Pleasant, Tenn.

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...reports Rochelle & Collison, Mt. Pleasant, Tenn.

Mining contractors, Rochelle and Collison, have compared costs, work-production and profits, and have the answer: the Planet Power steered International TD-24 is tops for tough overburden stripping!

"The TD-24 is the machine for stripping," declares George E. Collison, Jr., for the contracting firm. "Being able to steer under load without stopping one track makes the big difference.

"Planet Power steering plus the fast reverse keeps the TD-24 producing while other machines are loafing.

"For side-cutting (or benching), the TD-24 has no competition. Its rear end doesn't scoot away from the bank—not with the inside track in high range, and the outside in low!"

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Exclusive TD-24 Hi-Lo shifting permits instant gear-changing on the go—without stopping or even declutching. Fingertip matching of speed to load under full power speeds production!

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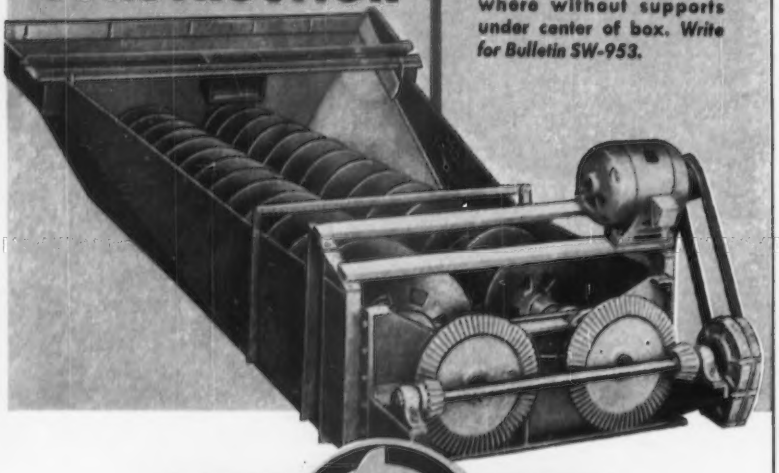

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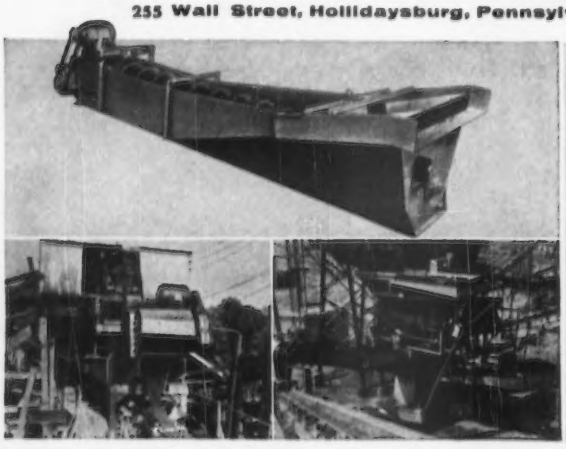

McLanahan Single Screw Washer.

(Far left) Single Screw Washer dewatering concrete sand.

Cleaning and classifying coarse and fine sands with McLanahan Screw Washers.

Michigan *(Continued)*

displaced employes as possible by increasing production at higher grade properties. Although development work will be continued, about 500 men will be laid off.

Homer mine at Iron River, M.A. Hanna Co., is experimenting with the use of a metallic fabric lagging, held in place by roof bolts, in a scraper drift. The chain-link fabric comes in rolls 60-in. wide. It has a 2-in. diamond shaped mesh and is of No. 9 gage wire. It holds back small pieces of rock which fall from the back or sides of the drift and is expected to make underground mining more safe.

Cleveland-Cliffs Iron Co. has moved in a diamond drill one mile north of Cooks, a small town in eastern Delta county near the Schoolcraft county western line and less than ten miles from Lake Michigan. Cleveland-Cliffs, the oldest iron mining company in the Lake Superior district, terms the drilling "a wildcat exploration" since it is not near either the Menominee or Marquette range.

The new Homer-Wauseca production shaft of the M. A. Hanna Co. in the Iron River district is being sunk 8 ft a day and has now passed the 500 ft mark. The eventual depth will be more than 2,000. Walsh Construction Co. of New York is sinking the shaft. Meanwhile the Worden-Allen Co. of Duluth and Milwaukee is fabricating and erecting the steel headframe. A Koepe hoisting plant, similar to the new hoisting plant at the Cliffs mine at Ishpeming, will be located in the upper part of the headframe.

North Range Mining Co. has been producing from its five underground mines throughout the 1957 season. The five include: Champion Mine on the Marquette range; Book Mine at Crystal Falls on the Menominee Range: Fortune Lake near Iron River; Warner Mines at Amasa, also on the Menominee; Penokee Mine at Ironwood on the Gogebic range.

For the second time in four years, the Buck mine of Pickands, Mather & Co. on the Menominee range has earned the Sentinels of Safety trophy which was presented to the mine employes Sept. 21. Mine placed first among underground metal mines of the national safety competition, having had over 500,000 man-hours in 1956 without a lost time accident.

Upper Peninsula Section of the AIME held its annual fall meeting at Ishpeming Sept. 28 with Grover Holt, president, in charge. Howard Graff of Inland Steel Co., chairman of the program committee, conducted visits to mines and plants. Among these were: the Tracy mine of Jones & Laughlin; and Cleveland-Cliffs Iron Co's ore improvement plant, research laboratory and Mather B. mine. The day's activities—also open to wives of members—were concluded with a dinner and dance.

Employes of the Embarrass mine at Biwabik, operated by Pickands, Mather & Co., received the "Sentinels of Safety"

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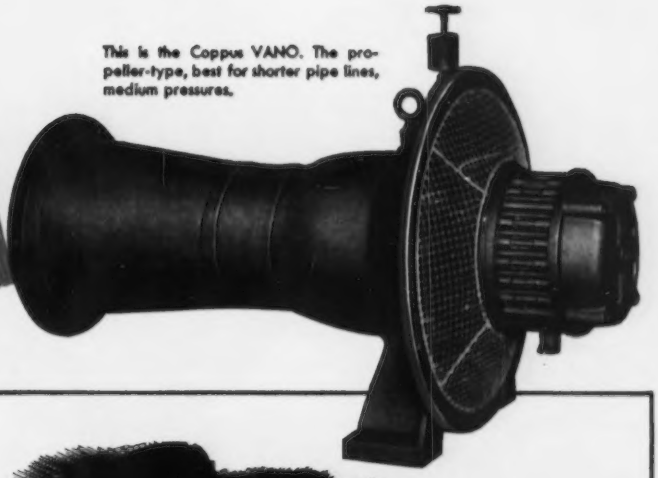

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Only Coppus makes both types — and both are made especially for *mine* ventilation. One or the other, operating under the conditions for which it is designed, delivers from 30% to 100% more air for a given power consumption than an ordinary all-purpose fan.

They can be used as blowers or exhausters and are driven either by compressed air or electric motor, with capacities up to 90,000 CFM. Like all Coppus products, these blowers wear the "Blue Ribbon" that stands for high achievement in engineering, workmanship and performance.

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M-S-A All-Service Mask®—
assures safe, comfortable breathing protection against smoke and toxic gases including carbon monoxide—singly—or in combination where there is sufficient oxygen to sustain life. U. S. Bureau of Mines approved.

Below is a check list of this equipment offered by MSA. If you would like to make sure your emergency program is up-to-date, why not have our representative check your requirements and suggest a regular inspection and maintenance schedule.

M-S-A Self-Rescuer®—
a miniature mask for use in deadly carbon monoxide following fire or explosion. Gives the miner precious minutes of emergency breathing protection. Unit is compact, lightweight; may be stored in quantity underground or carried individually. U. S. Bureau of Mines approved.

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designed for 30 minutes maximum breathing protection in any atmosphere—supplies air or oxygen in exact accordance with breathing requirements. Flow ceases during exhalation for added economy. Comfortable to wear and easy to use.

M-S-A Pneolator®—
provides automatic artificial respiration that assures maximum chances of recovery for victims of poisonous gases, electrical shock, heart attacks, or other causes of asphyxia. Housed in compact, lightweight glass fiber case.

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Michigan *(Continued)*

award. The mine won the national safety competition for open pit mines of the U.S. by working 505,932 man-hours without a lost time accident. Fred Seaton, Secretary of the Interior, made the principal talk at the award ceremonies. Embarrass mine also won the trophy in 1949 and 1950. George C. Watts is superintendent at the mine; Ted Renfors is district safety inspector and C. E. Hager, Hibbing is district safety supervisor.

MINNESOTA

Stockholders of Oglebay, Norton & Co., and nine firms for which it has acted as sales and management representative, have been asked to vote on a plan for merging as a single unit under the name of Oglebay, Norton & Co. Common stock of the new company, whose headquarters would be in Cleveland, would be offered stockholders of the nine concerns involved. The nine companies included are: Montreal Mining Co.; Columbia Transportation Co. with 22 vessels on the Great Lakes; Ferro Engineering Co.; Saginaw Dock & Terminal Co.; Richmond Sewell Coal Co.; Fairport Machine Shop, Inc.; North Shore Land Co.; Standard Box Co. and Pringle Barge Line Co.

New Pierce mine of the M. A. Hanna Co. at North Hibbing is well under way on its stripping program. This will require the removal of about 8½-million cubic yd of surface material by the 1150 B. dragline and 1½-million cubic yd by 3- and 8-cubic yd shovels and 20-cubic yd trucks. In addition there will be some 15 million yards of rock and lean ore to be handled. The average depth of overburden is 100 ft.

MONTANA

Hecla Mining Co. has concluded a contract with Montana Standard Mining Co., Ltd., providing for exploration and development of the old Montana Standard property on Prospect Creek in Sanders County, about six miles east of the Idaho-Montana border. The contract requires that Hecla finance the development program, in return for an option to acquire a 50% interest in any ore that may be found. It also gives Hecla an option to purchase the entire property for $300,000, payable at the rate of $50,000 annually. The latter option runs to Jan. 1, 1961.

Montana Standard mine yielded some high-grade lead-silver ore from surface workings in the early 1900's and was subsequently developed extensively through a lower adit. Some good milling ore was found, but operations were handicapped by lack of a mill and the property lay idle for many years. It was reactivated by the company in 1953.

NEW MEXICO

Kennecott Copper Corp. is giving away $1,147,600 worth of buildings, land and equipment to civic, religious, educational and fraternal organizations in Santa Rita and Hurley.

W. H. Goodrich, general manager of the company's Chino Mines Division in southwestern New Mexico, said that the gifts were made in conformity with a company move "to get away from the paternalism of the old-fashioned company town".

Formation of Capitol-Seaboard Corp., a merger of Capitol Uranium Co. and Seaboard Oil & Gas Co., was completed at Farmington, N. M. New company controls oil reserves in Archer and Young Counties, Tex., three producing uranium mines in New Mexico, a cobalt property near Blackbird, Idaho and undeveloped uranium properties in Texas.

Officers of the new firm include Floyd H. Corbin, chairman; Joseph H. Corbin, president; Charles W. Yetter, executive vice president; Roy Iles, vice president; Ray A. Bennett, vice president; Howard L. Corbin, treasurer; and William A. Pope, secretary. All are directors of the new corporation.

NEVADA

Eureka Corp., Ltd., has announced reduction of operations at its Ruby Hill mine in Eureka County.

The cutback, which drops 40 miners from their job, is attributed to the diffi-

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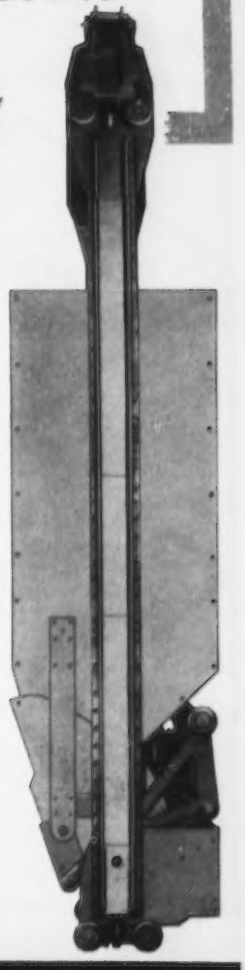
Island Creek Coal Co.
Raleigh-Wyoming Mining Co.
Freeman Coal Mining Co.
Peabody Coal Co.
United States Steel Corp.
National Steel Corp.
Eastern Gas and Fuel Associates
Berwind-White Coal Mining Co.



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Wherever and whenever the operator has a problem the Christensen Diamond Products Company Engineer is available for consultation and advice. This teamwork between CDP engineer and operator solves the problems where they are, in the field. A recent example occured in the Gas Hills of Southwestern Wyoming: Core recovery was running only 40 to 60 percent. The problem was first thought to be the failure of core catching devices, but the Christensen engineer with the driller, pinpointed the problem to circulation. Result: a new barrel and bit design that increased core recovery to 96.7%.

Christensen equipment is engineered for the job, there is a bit and barrel design adaptable for your coring or drilling problem.

"less cost per foot"

CHRISTENSEN DIAMOND PRODUCTS

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Nevada *(Continued)*

culty the company is having in finding smelters to treat ore containing arsenic.

A spokesman for the corporation told *E&MJ* that shipments in recent months had been made of the silver-lead-gold ore to Selby, Calif, plant, East Helena plant and Leadville, Colo. plant of AS&R, to International Smelting & Refining Co. at Tooele, Utah and United States Smelting Refining & Mining Co. plant at Midvale, Utah.

Manpower reductions will leave only 20 miners employed at the Ruby Hill mine. Eureka Corp. is an affiliate of Ventures, Ltd. and the prospect in the Eureka district of Nevada has attracted national attention of the mining industry to this area in recent years.

United Mercury Co. has reduced operations at its flotation plant in Pershing county to one shift per day due to lack of water, according to James Goldsworthy, mill superintendent. When the mill was constructed it was expected that sufficient water would be available from a nearby mine shaft to operate the mill on a 24-hour basis, but this did not prove true.

Ore supplies from the company's mine in the Antelope district north of Lovelock are plentiful, and construction of a rotary furnace is planned to eliminate the need of increased water supply.

Eagle-Picher Co., which employs 200 men at its big diatomaceous-earth processing plant at Clark Station, 25 miles east of Reno, is planning to construct a new plant for the same purpose at Colado, six miles east of Lovelock. The new mill will be built to process diatomaceous earth mined near Trinity mountain west of Lovelock. Design of the plant calls for a mill capable of processing 166 carloads per month. Colado, like Clark Station, lies beside the Southern Pacific main line, and processed output is shipped to the east for marketing. Dodge Construction Co. and Minerals Materials Corp. are presently using the loading facilities at Colado for the output of their big iron mining operations 20 miles south of the loading docks. Eagle Picher recently contracted with the City of Lovelock for a water supply of 200 gpm which will be needed at the Colado plant.

A two-unit mobile mill mounted on two trucks has been installed and is now operating at the Cinnabar Mine in the Columbus district of Esmeralda county. Dick Henderson, T. H. Morgan, Jack Lubajacky and John Childress, all from Texas, and Kenneth Powell from Gold Point, Nevada, are in charge of the operation, and are processing ore containing gold and other values. One unit has a loading, feeding, milling and screening process, and the other storage, conveyor, concentrator and tailings disposal facilities.

Kennecott Copper Corp. laid off 125 of its 1,900 employees in the Ely area at the end of September. J. C. Kinnear Jr., general manager, blamed the action on declining copper prices. "The layoffs", he said, "are in line with the continuing

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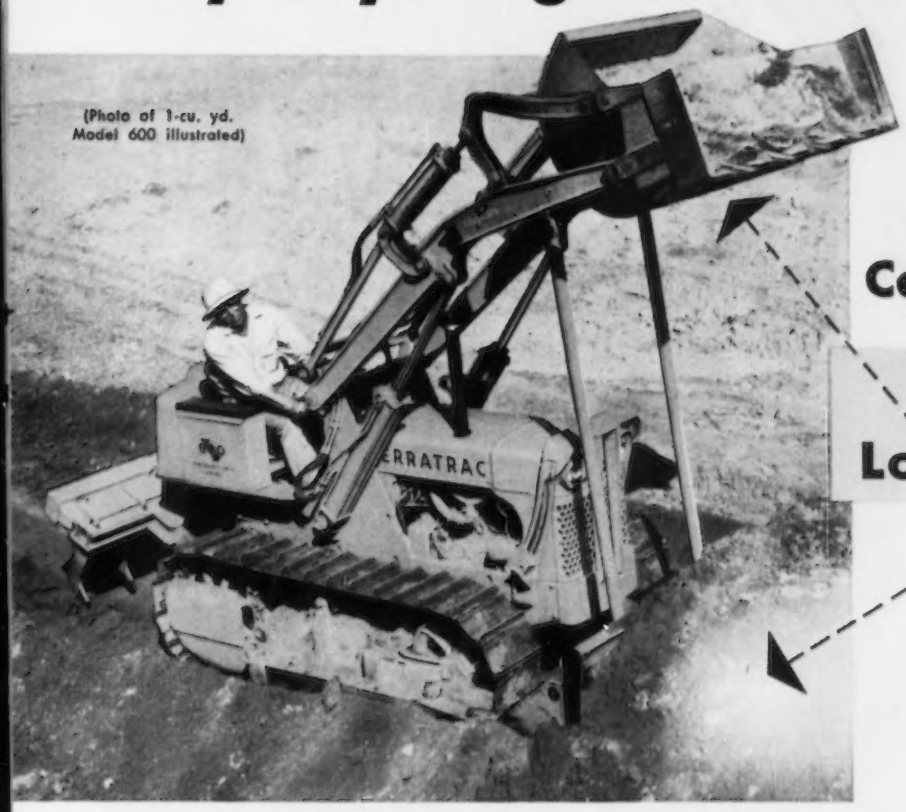

(Photo of 1-cu. yd. Model 600 illustrated)

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If you need a front-end loader, as well as a dozer — but don't have full-time work for *both* — there's no longer any need to buy *two* machines and hire *two* separate operators to run them.

Now, for only a few dollars more than the cost of a *single*-purpose rig, you can get a *multi*-purpose Case TerraTrac crawler, with combination loader and dozer. This gives you the *versatility* of two highly efficient work-tools, with the *economy* of one tractor, one hydraulic system, and one operator.

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Capacities up to 2 cu. yds.

Case TerraTrac combination loader-dozer units are available in 10 gasoline and diesel-powered models — *from 42 to 100 HP, with ⅝ to 2-cu. yd. buckets.* Largest models feature torque-converter drive and exclusive counter-rotating Terramatic transmission, with instant power-shift, and power-steering, which give you much higher working speeds and greater ease of maneuverability than any conventional crawler tractor. These larger Case TerraTrac units also give you the important advantage of torsion-bar track suspension and automatic track roller lubrication, which cuts greasing time from once a day to a few times a year. Mail coupon today for complete facts on sizes best suited to your needs.

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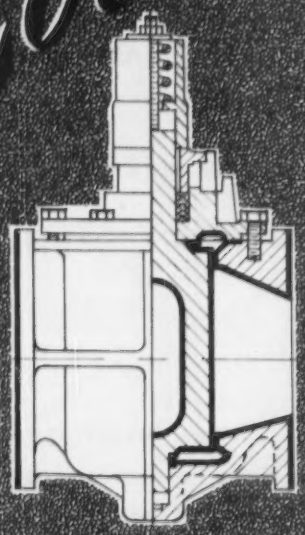
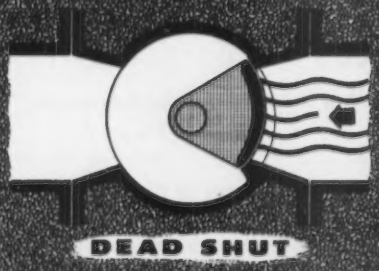


DeZurik Soft-Rubber-Lined Valves Resist Abrasion . . . Withstand Corrosion!

Slurry service lines demand *extra* resistance . . . *extra* toughness . . . from *any* valve.

DeZurik Soft-Rubber Lined Plug Valves take *both* abrasive *and* corrosive services without damage. The plug seats without scraping or sliding on slurry particles. Seating surfaces and bearings which carry the plug are not directly exposed to the flow . . . cannot become pitted or worn from high velocity slurries. And DeZurik Valves operate easily—all the time—regardless of size or internal pressure! Their soft-rubber lining and rubber-covered high alloy plugs withstand the toughest slurry service.

exclusive ECCENTRIC ACTION



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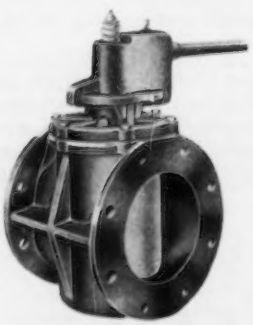
DeZurik's exclusive eccentric action pivots the plug eccentrically, sealing on the eccentrically-raised body seat. There is NO FRICTION between plug and body; NO LUBRICATION needed to maintain easy operation or tight shut-off! Opening the valve *backs* the plug away from the seat—without scraping or scoring. The resilient-faced plug seals dead-tight—every time—on slurry particles.

Iron-bodied, rubber-lined DeZurik Valves with Durimet 20 rubber-covered plug were furnished for an installation on 26% uranium ore in a 1% sulphuric acid solution. The customer reports longer valve life and better resistance to abrasion and corrosion on this service than he ever had before.

Try DeZurik on *your* tough services. You'll save money in initial cost and in the long run.



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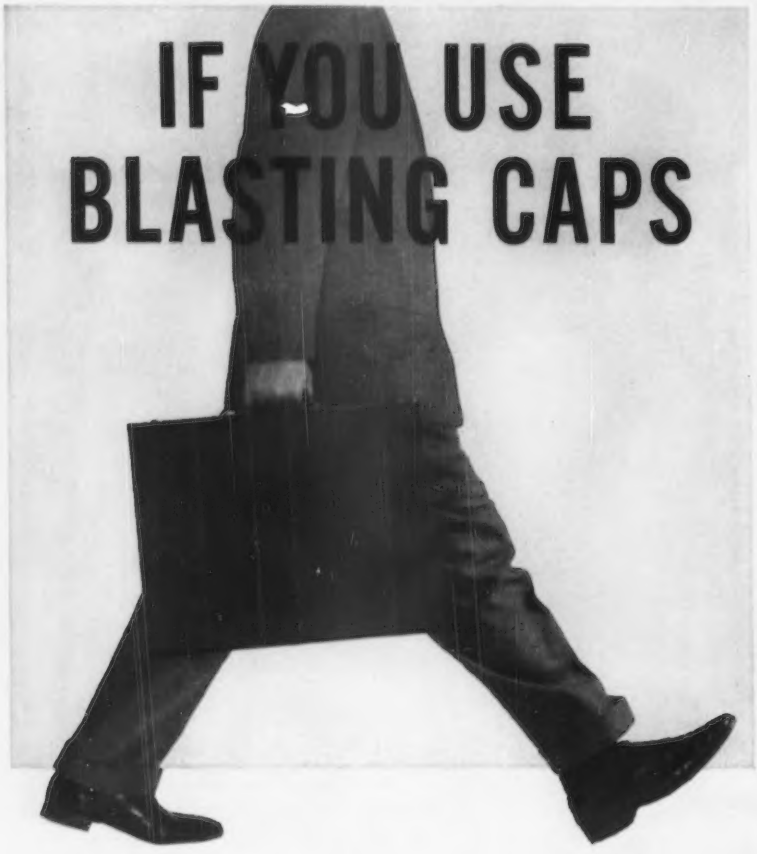
Nevada *(Continued)*

effort to reduce operating costs and thereby remain competitive in the weakening copper market." During March the firm released 150 employees and later reduced the work week from six to five days. At present 50 jobs at the firm's Nevada mines division are under study to determine their necessity, indicating more layoffs are contemplated.

Standard Slag Co. will continue operation of its iron ore mining property in Lyon County, despite a recent order which reduced ore shipments by 40%. John Mattice, mine superintendent, said reduction of operations was due to a cutback in the steel industry in Japan, which has been the main market outlet for the Lyon County operation. One shift has been eliminated at the mine, and the crew was reduced from 50 to 35 men, but the daylight shift will continue to operate.

NORTH CAROLINA

Cleveland Minerals and Carolina Mines, Inc., have begun mining and processing kyanite ore at Kings Mountain. Carolina Mines is engaging in the mining under a contract with Cleveland Minerals, owner of the mineral rights.



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See Details in our Ad on Pages 134-135

X867-6

Tungsten Metals Corp., owned 70% by Halle Mines and 30% by General Electric Co., appears to be the only major firm in United States producing from a solely tungsten orebody.

Blair Burwell, Jr., officer of Minerals Engineering Co., of Salt Lake City and Grand Junction, Colo., announced closure of that firm's Calvert Creek open cut tungsten mine and mill near Glen, Mont. He said that only other major producers were Union Carbide Corp., at Bishop, Calif., which was mining a copper-molybdenum-tungsten stope with the other metals carrying the tungsten. Similarly, Climax Molybdendum is engaged in some tungsten output at Climax, Colo. Other major producers of tungsten which have shut down because of a downward dropping price (offers in west are as low as $7 a unit plus tariff), include: Getchell Mines, Inc., Nevada-Massachusetts Mining Co. and Wah-Chang Corp., all in Nevada.

OHIO

Brush Beryllium Co., Cleveland, has completed its new Elmore plant for the production of beryllium metal.

Costing about $4.5-million, Elmore facilities are designed to produce 20,000 lb per month of beryllium in hydroxide form and 10,000 lb per month of vacuum cast beryllium metal.

According to company officials, a plant dedication and open house program was planned for mid-November.

OREGON

Thunderbird Mining Corp. of Medford has reactivated the Cynthia chrome mine in Josephine County. The mine is located at about 5,000 ft elevation in the rugged Whiskey Peak area.

First shipments of chromite were made in mid-August and by mid-September about 100 tons of good grade chromite, assaying from 46 to 48% Cr_2O_3 with a 2.3 to 2.5 Cr:Fe ratio had been shipped to Grants Pass. About five miles of road were constructed into the mine. Earlier production of the mine was taken out by pack animals.

PENNSYLVANIA

Alan Wood Steel Co. will construct a new plant for the production of iron powder. Plant will cost approximately $3.6-million and will have a 50 tpd iron powder capacity.

TEXAS

Trans-Pecos Minerals, Inc. have announced completion of the first phase of their DMEA Project No. 4476 involving 4680 ft of diamond core drilling at the old Hazel copper-silver mine north of Van Horn in Culberson County. They report that the Bureau of Mines has informally approved stage two of the project with a scheduled additional 10,000 ft of core drilling. Company also reports that preliminary sampling of the existing dumps have been encouraging with values ranging from 1 to 2% cu and 2 to 3 oz Ag.

15-hp Carrier unit expected to pay for itself in year, ON MAINTENANCE SAVINGS ALONE!

The 78′ Carrier Natural-Frequency Conveyor shown here is about to be hit by two giant molds which will be quickly and efficiently conveyed to a shakeout.

This big mid-western foundry had formerly used a 30-hp "slow-advance — quick-return" reciprocating trough conveyor, mounted on rollers. It was a "brute-force" unit and required constant work to keep it in service. The high temperature of the sand and castings (up to 1500°F.) — two-ton shock loads on the rollers — high stress concentration at the drive — and severe abrasive wear in the many moving parts . . . *all contributed to maintenance and downtime costs in excess of $20,000 per year!*

With just *half* the horsepower, the Carrier Natural-Frequency Conveyor does *twice* the job! It handles surge loads as high as 290 tph. An extra-deep trough contains sand "splash" and eliminates spillage. Stress distribution is uniform because the rugged coil springs supporting the trough are evenly spaced, thus preventing fatigue failure of structural members. And Carrier's patented drive, which is available in NO OTHER CONVEYOR, *permits the conveyor to settle under load so that shocks from 2-ton dumps are not transmitted to the drive bearings!*

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-NATURAL-FREQUENCY®-
CONVEYORS

UTAH

Slump in copper, lead and zinc prices will cut Utah's tax revenues from corporation franchise sources by 15 to 20%, according to the Utah State Tax Commission.

Last year, the state collected $5.6-million alone from Utah Copper Division of Kennecott Copper Corp. Computation is based on business profits.

Howe Sound Co. will move its executive offices from New York to Salt Lake City in spring of 1958.

Making the move to new quarters above firm's research center at Salt Lake City will be Cecil Roper, president; V. A. Clark, vice president-mining; H. A. Pearse, vice president-metallurgy, and W. T. Holmes, secretary and treasurer.

The change will place company executive echelon in closer contact with Western operations and provide more unified development program, it was announced.

Marysvale uranium district is undergoing a new prospecting boom.

Vanadium Corp. of America has conducted extensive work on the "Farmer John" claims of Bullion Monarch Mining Co. which adjoin its main workings in Piute County.

Golden Cycle Mining Co. has interests in 1,700 acres of claims and plans shipments of up to 200 tpd by year's end.

Meanwhile, Phillips Petroleum Co. has made a deal with the Potts interests of Marysvale for claims on Mount Baldy across the valley from the VCA workings and is engaged in an extensive exploration program on uranium outcrops.

New Park Mining Co. suspended operations at its Mayflower, Park City district lead-silver-zinc mine, effective Sept. 27, according to announcement by W. H. H. Cranmer, company president.

Some 200 miners will be laid off. It is understood the firm might give some consideration to establishment of a "leasing system" at the property.

Suspension leaves United Park City Mines Co. as sole operator still mining at Park City. UPC reported losses during 1956 and forepart of 1957.

New Park was shipping its concentrates to Midvale smelter of United States Smelting Refining & Mining Co. That company also is reported in recent months to have reduced employment at its Lark-Bingham district lead-silver-zinc mines.

Bear Creek Mining; Co. reports commencement of exploration drifting in its Tintic project seeking lead-silver-zinc ores in East Tintic district.

Contractors Centennial Development Co. have finished cutting station and have advanced some 200 ft in a drift westward toward a core hole where ore was reportedly found.

The core hole is about 800 ft from the exploration shaft Centennial finished for Bear Creek, domestic exploration affiliate of Kennecott Copper Corp.

Utah Copper Division of Kennecott Copper Corp. is reported aiming at a 10% reduction in working force to achieve greater efficiency in production of copper.

The drive follows a 30% reduction accomplished by Nevada Mines Division in recent months. This was accompanied by increase in output.

L. F. Pett, Utah Copper general manager, while not confirming the 10% goal, announced that cost reductions will be accomplished by:

1. End of new hirings wherever possible.
2. Reduction of inventories.
3. Economies in methods of mining, milling, refining as well as in "general operations."

First shipment of clay from Latah county, Idaho, for producing alumina at Anaconda company's new pilot plant at Anaconda, Mont. was to be made by the end of October, officials said.

The company has contracted with Commercial Builders, Inc., of Moscow, Idaho, to open a pit on property about four miles west of Deary, Idaho. In charge of the operation for Anaconda are Walter J. Dezelle, mines superintendent, and W. H. McNair, geologist.

The firm plans to ship about 10,000 tons of clay to the Anaconda plant at the rate of 10 carloads a day. Work on the pit began this week. About 25,000 tons of overburden will be stripped before reaching the clay beds, which are as

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Kennametal Style PX Rock Bits are available in sizes from 2½" to 5" diameter.

Improved "X" design eliminates rifling, provides greater chip clearance and promotes faster penetration. Alternate long and short carbide insert design puts the carbide where it is needed most, and also speeds penetration. Two off center water ports improve the removal of cuttings.

Longer bit life in service is provided by three new design features: First, these bits generally have more carbide than other bits of equal size. Second, the long inserts are segmented for greater strength. Third, all inserts are of special grades of carbide that were developed specifically for percussion drilling.

This new design eliminates the center spacer, a common source of trouble in drilling operations.

Investigate these bits for your drilling problems. A Kennametal representative will help you select the size and grade of Kennametal Rock Bits for each of your operations. Call him or write KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania.

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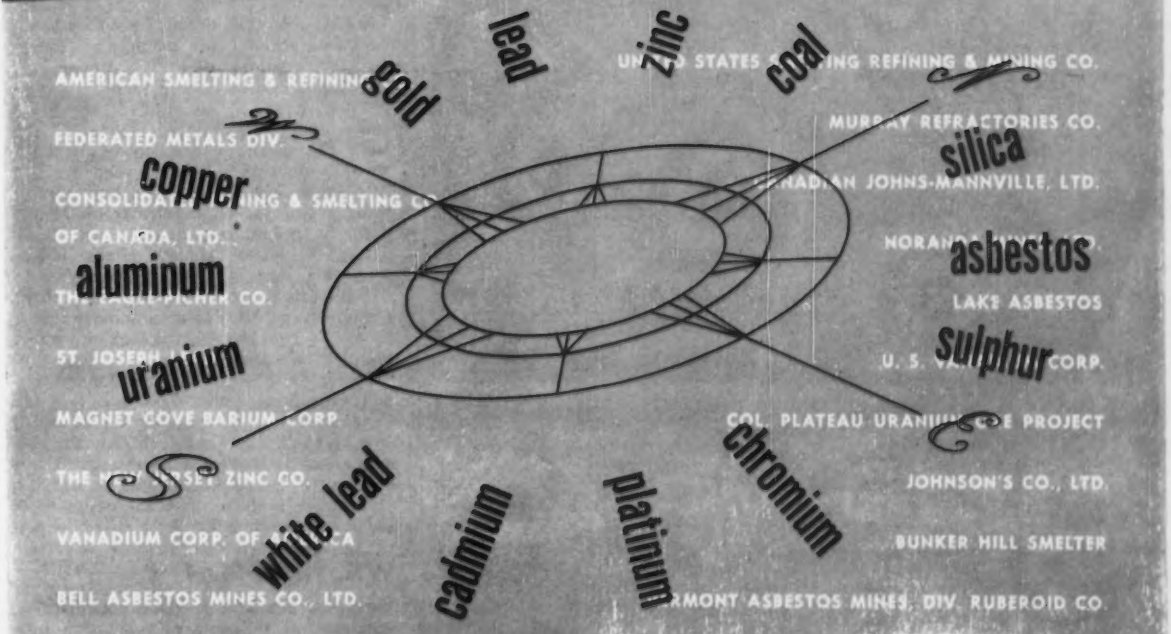

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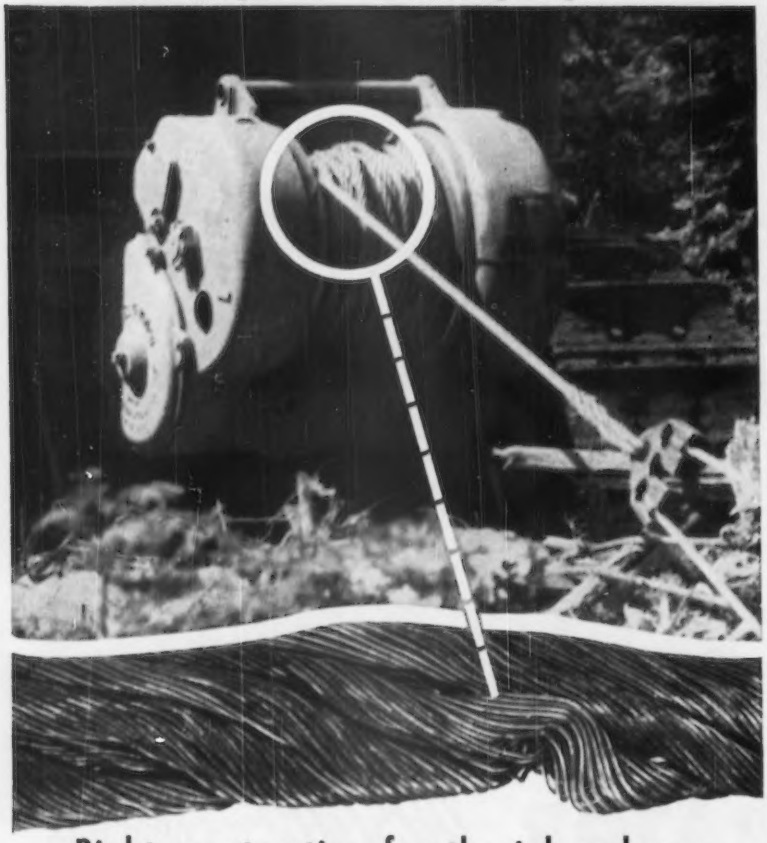
is this your wire rope problem?



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Once wire rope is crushed or pinched out of shape on sheaves or drums, useful life is drastically shortened. More often than not, this loss can be prevented. Minor changes in equipment, adequate inspection or using the most suitable rope construction may eliminate the difficulty entirely. These and other solutions are clearly explained in Bulletin No. 102 which is yours for the asking. By all means write for your copy today. Feel free, too, to ask for solutions of any other wire rope problems you'd like to have solved. The full resources of our engineering staff and field organization are at your service. Address: Leschen Wire Rope Division, H. K. Porter Company, Inc., St. Louis 12, Missouri.

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WIRE ROPE

H. K. PORTER COMPANY, INC.
LESCHEN WIRE ROPE DIVISION

Utah (*Continued*)

deep as 20 ft below the surface. The clay will be trucked to Deary and then sent by rail to Anaconda.

At least one uranium venture by a group of businessmen not connected with mining has begun to pay off in a substantial fashion.

Industrial Uranium Co., Salt Lake City, has placed its 27,000 shares controlled by some 30 persons on a $5 annual dividend basis.

The company, in its first dividend declaration, covering first half of 1957, announced a distribution of $2.50 a share.

Vitro Uranium Co. of Salt Lake City has won contracts for ore purchasing from Jen, Inc., operators of the Cord mine in Big Indian District, San Juan County.

Thus ends a competitive struggle among uranium milling companies in Utah and Colorado for control of the 400,000 ton orebody once owned by E. L. Cord and Associates of Reno, Nev.

Mr. Cord earlier this year sold the property to Jen, Inc., headed by C. E. Tuttle, Baltimore, Md., in largest uranium mine sale in American history.

With values averaging 0.70 U_3O_8, the ore in place at the Cord mine is estimated to be worth about 24-million it was reported in uranium circles.

Under the contract between Jen, Inc., and Vitro Uranium, a division of Vitro Corporation of America, some 10,000 ton monthly will be shipped to Salt Lake mill. The contract, ending March 31, 1962, also gives Jen, Inc. option on 30 days notice to hike these shipments to 12,000 tons a month.

WASHINGTON

North Star Uranium, Inc., has completed arrangements to begin shipping ore to the new mill of Dawn Mining Co. at Ford. John F. Campbell, North Star president, said the shipments were to begin Oct. 1. North Star plans to ship 1500 tons of ore in lots of 500 tons. He said that 500 tons of ore is in stockpile at Lehmbecker lease on Mount Spokane and a second 500 ton stockpile has been started.

Exploration work was resumed at the Kit Carson property on Mount Spokane early in October by Daybreak Uranium, Inc. Kae H. Sowers, secretary-treasurer of Daybreak, said a crew is uncovering an new radioactive shear zone.

Meanwhile, the firm is continuing activity at the Dahl lease on Mount Spokane, the company's leading uranium producing property. So far, Daybreak has shipped almost 1,000 tons of ore to the new Dawn processing mill.

WISCONSIN

Iron County has retained Prof. Murray Riddell of the Michigan Tech faculty as its adviser in lease negotiations involving some 28,800 acres of county-owned land in the towns of Anderson, Saxon and Kimball. An unnamed mining company is reported as being interested in leasing the tract.

WYOMING

Shoni Uranium Corp. stockholders have approved a contract for Vitro Minerals Corp. to operate 51 of its claims in the East Gas Hills area of central Wyoming, but tabled a proposal allowing Vitro to acquire control of Shoni through a purchase of treasury stock.

Shoni also announced it has received favorable drilling reports on claims acquired this summer in the Shirley Basin area, southeast of the Gas Hills.

Shoni drilled more than 7,000 ft in Shirley basin mostly to validate 110 claims. Vern Hughes, president, said further drilling is planned.

Shoni also has acquired 58 claims on the Beaver rim at the head of Conant creek where a mine was operated by Cheyenne Mining and Uranium in 1955.

The company has completed the first phase of an exploratory drilling program and reopening of the mine.

Wyoming's first uranium mill, Western Nuclear Corp.'s 400-tpd plant, was dedicated Sept. 12 at Jeffrey City.

Sen. Bourke B. Hickenlooper (R-Iowa), a member of the senate atomic energy committee, and Dr. John Dunning, Columbia University engineering school, were principal speakers at the ceremonies. Also participating were Senators O'Mahoney (D-Wyo.) and Barrett (R-Wyo.) and Rep. Thomson (R-Wyo.).

Robert W. Adams, Western Nuclear president, revealed that the mill already would be capable of doubling its 400 tpd milling quota. Western Nuclear has applied for AEC authority to expand its production to 1200 tons.

Several hundred visitors toured the mill, Western Nuclear's open pit mine in the Gas Hills area and the newly-established town of Jeffrey City during the dedication.

Gas Hills Uranium Co. has been granted an option to purchase 21 claims of Antelope Mines. Claims cover 420 acres of land in the central Gas Hills area.

Drillings rigs have been moved in by Gas Hills Uranium to evaluate the claims. Two different orebodies, one at the 80-105 ft level and another at the 160-210 ft level, have been blocked out by N. P. Juneman, manager of the Antelope Mines.

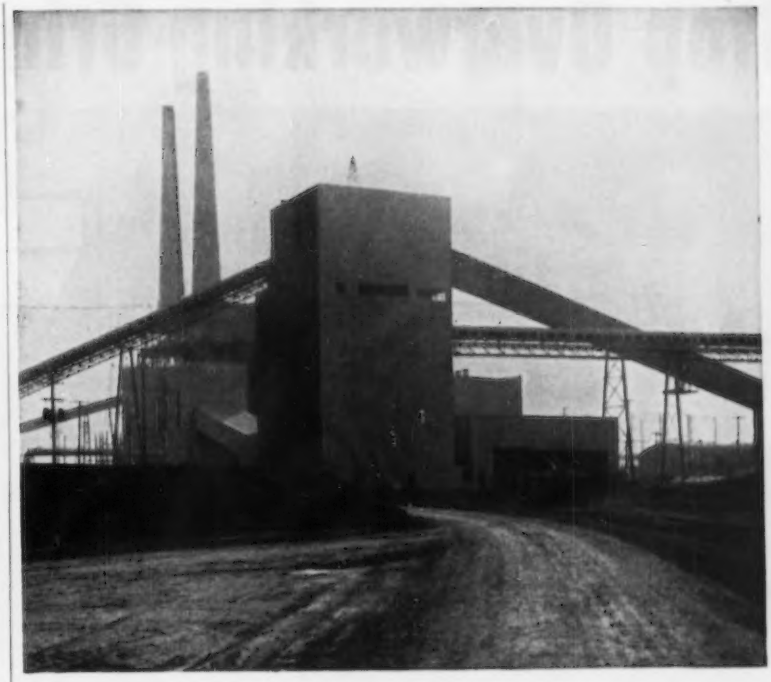
Antelope was given 10,000 shares of Gas Hills stock for the option. To exercise the option, 300,000 shares of Gas Hills stock would be paid Antelope Mines.

Another feature of the contract is a performance clause which calls for payment of $15,000 a year in cash advance royalty after two years. The over-riding royalty retained by Antelope is 10%.

Location of an aluminum plant proposed for the Lake DeSmet area of northeastern Wyoming can become a reality now that Pacific Power & Light Co. has completed its 161,000 volt transmission line between Casper, Wyo., and Billings, Mont., Paul B. McKee, Pacific president, said.

He made his remarks at a ceremony dedicating the 251-mile transmission line.

Reynolds Metals Co., a subsidiary of Reynolds Aluminum, has an option on



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One of the largest in the U. S., this system depends on over 7,000 feet of Quaker Rubber belting to keep the coal moving.

PROBLEM: The Detroit Edison Company needed three separate conveyor systems to carry coal into their River Rouge power plant: (1) dock to storage, (2) dock to breakers to plant, (3) storage to breakers to plant.

SOLUTION: Quaker engineers and the Quaker distributor's men, working with engineers of the power plant, suggested the use of a belting designed for high lifts and long center distances. Over 7,000 feet was installed.

RESULT: The three conveyor systems work smoothly and efficiently, carrying coal into the plant at the rate of one million tons a year.

YOUR PROBLEM: Whatever your conveyor needs, whatever your industry—there's a Quaker Rubber Belt (or Hose) of the *right* construction to handle the job safely and economically. Quaker engineering service is available for the asking.

To make sure 7,000 feet of Quaker Rubber conveyor belting (available in 48", 60" and 72" widths) was properly installed, splicing and vulcanizing of the belting was supervised by a Quaker Rubber specialist.

For your free brochure on conveyor belting, write your nearby Quaker Rubber distributor, or:

H. K. Porter Company, Inc.,
Quaker Rubber Works,
Philadelphia 24, Pa., or
Pioneer Works, Pittsburg, Calif.

H. K. PORTER COMPANY, INC.
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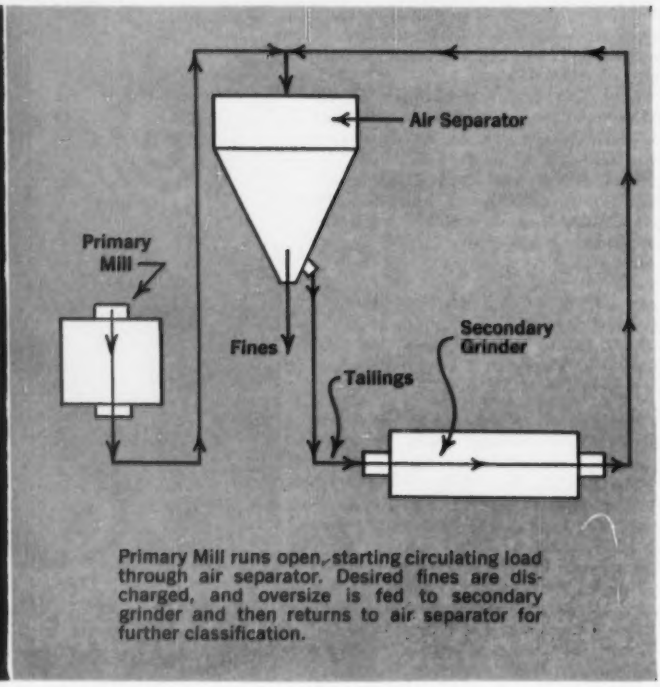
Stop Overworking Grinding Mills

FEED SPOUT
Sturtevant Air Separators come in 9 models, diameters range from 3 to 18 ft.
TAILINGS DISCHARGE
FINES DISCHARGE


Air Separator
Primary Mill
Fines
Secondary Grinder
Tailings
Primary Mill runs open, starting circulating load through air separator. Desired fines are discharged, and oversize is fed to secondary grinder and then returns to air separator for further classification.

LET STURTEVANT AIR SEPARATION HELP YOUR SYSTEM PRODUCE UP TO 300% MORE 40 TO 400 MESH FINES — CUT POWER COSTS AS MUCH AS 50%

Fines that pass through grinding mills unhindered, serving only to increase the work load, can be quickly classified by a Sturtevant Air Separator operating in closed circuit. With all oversize automatically returned for further grinding, the result is production capacity impossible to achieve in single-pass grinding — as well as a better, more uniform product.

Closed circuit grinding and air separation is of proved advantage in *all* secondary reduction processes. Grinding mills are free to perform at top efficiency, their output frequently increased as much as 300% and power costs cut up to 50% (documented by 30 years of Sturtevant air separation experience in the cement industry). Further, attritional heat is dissipated by greater surface exposure.

Sturtevant Air Separators Keep Grinding Units At Peak Efficiency — Classify Feed Loads to 800 Tons Per Hour

Sturtevant Air Separators circulate production loads with exact control of air currents and centrifugal force. Simple adjustments make possible counter-action between the two to the point where a product of almost any desired fineness may be collected while coarser sizes are rejected.

A 16 ft. Sturtevant, for example, took a feed rate of 800 tph, containing only a small percentage of desired fines, and delivered 30 tph 90% 200 mesh, recirculating the oversize through the grinding circuit. (In the cement industry, Sturtevant units deliver up to 60 tph raw cement fines, 40 tph finished cement fines.)

Sturtevant's ability to engineer precise, high capacity classification for closed circuit grinding systems is the result of long experience with a wide variety of dry processes. Sturtevant designed its first air separator some 40 years ago — and has been pioneering developments in centrifugal classification ever since.

Current users of Sturtevant Air Separators include manufacturers of sulfur, soybeans, phosphate, chocolate, feldspar, sand, pigments, limestone fillers, abrasives, plasters, ceramics and cement.

Designed for precise separation of all granular materials, Sturtevant Air Separators have been adapted to other materials as well. Johns Manville, for example, uses a 10 ft. model to separate 3 to 6% undesirable rock from asbestos.

Ruggedly constructed, Sturtevant units are designed for minimum maintenance — at a Midwestern rock-crushing plant, a 10 ft. Separator operates outdoors year-round with only routine care.

For further information, request Sturtevant Bulletin No. 087. Write Sturtevant Mill Co., 101 Clayton St., Boston 22, Mass.

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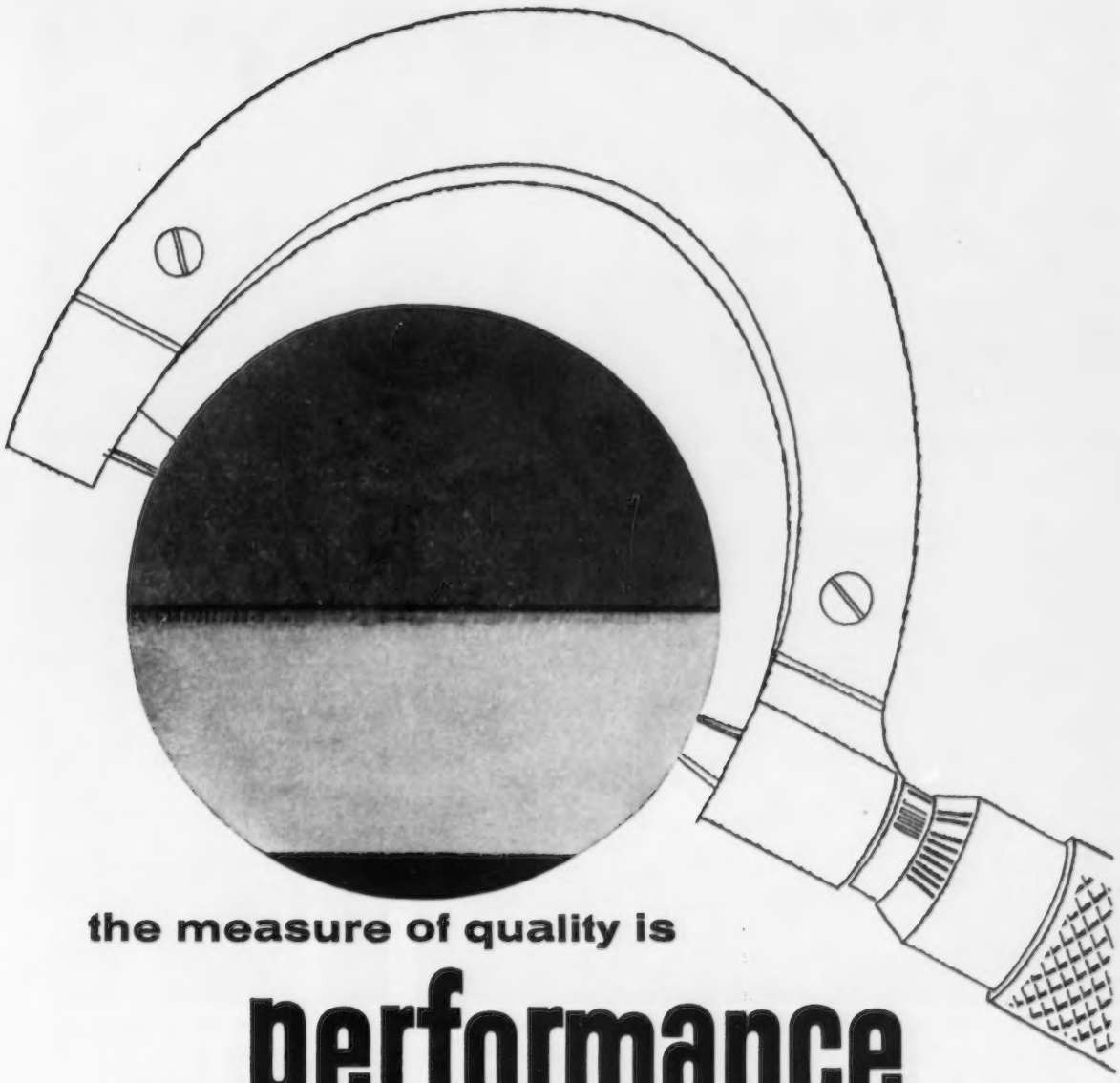

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Moly-Cop Grinding Balls perform superbly on toughest grinding jobs because they have the necessary hardness to stand up to the long economical grind. They wear evenly because of that hardness which is uniform right to the core. That's the result of technological control in alloying, forging and heat treating by Sheffield. And the reason why Moly-Cop Balls are THE STANDARD OF COMPARISON AROUND THE WORLD.

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BANQUET GUESTS OF HONOR hold trophies awarded by *E&MJ, Coal Age,* National Coal Assn., UMW, and USBM.

KENTUCKY Exposition Center is crowded with forty-seven competing teams.

SAFETY LAMPS were *E&MJ* awards.

Strong Competition Marks National Safety Meet

FORTY-SEVEN FIRST AID and mine rescue teams matched skill and speed in the 17th Biennial National First Aid and Mine Rescue Contest at Louisville, Ky.

First place winners of the competition, held in the Kentucky Fair and Exposition Center were: first aid—Island Creek Coal Co.'s Wyoming mine; mine rescue —U. S. Steel's Lynch District. Forty-seven teams competed in the first aid group and seven in the mine rescue.

In the latter group, winners included captain Ted Hollin, William Hollin, Lee Marsili, Grank Sizemore, Doyle Cunningham, Charles Steel and Robert Wilkinson. First aid winners, captained by Willard Graham, included William McClure, Herbert Clay, Gabor Gombos, William Dalton, James Hylton and W. L. Ogle.

Second place in first aid was won by Robena No. 2 team, Frick District, U. S. Steel and third place by Georgetown No. 12 team, Hanna Coal Division, Pittsburgh Consolidation Coal Corp. Second and third in mine rescue were won by Mine 22, Bethlehem Mines Corp., and Price No. 1 team, Inland Steel Corp.

Prizes were awarded by the National Coal Association, U. S. Bureau of Mines, United Mine Workers, Mine Safety Appliances Co., *Coal Age* and *Engineering & Mining Journal. E&MJ*'s award was a Mine Safety Appliance safety lamp with gold plates mounted, awarded to the first place team in each category.

Wyoming *(Continued)*

coal lands bordering Lake DeSmet and has been studying the feasibility of a plant.

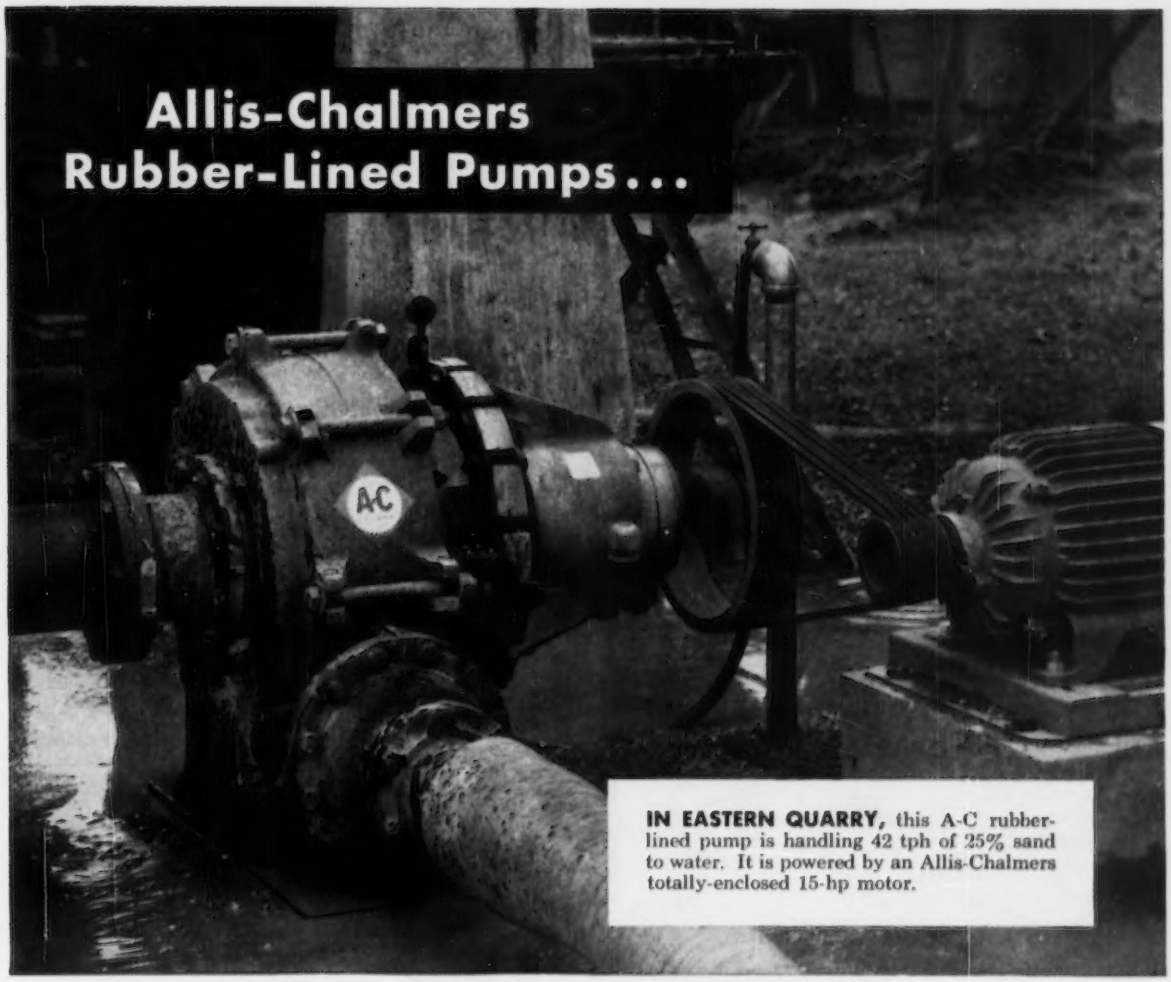
McKee also said the transmission line and completion of Pacific's steam plant at Glenrock would provide adequate power to Columbia-Geneva division of U. S. Steel it it goes ahead with plans to develop low-grade iron ore deposits near Atlantic City.

P-C Mining Corp. has begun exploring its East Gas Hills property under an $81,200 contract with the Defense Minerals Exploration Administration.

About 75,000 ft of hole will be drilled. Twenty three test holes will be drilled to a depth of 650 ft and another 77 will be drilled to 250 ft.

P-C Mining Corp. also announced acquisition of 27 claims in the Shawver group that adjoin P-C's Thunderbird group of claims.

Trans-State Mining Co. has estimated its



IN EASTERN QUARRY, this A-C rubber-lined pump is handling 42 tph of 25% sand to water. It is powered by an Allis-Chalmers totally-enclosed 15-hp motor.

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Rubber Lining of this A-C pump is bonded to a rugged steel skeleton which is simply fitted to the casing. When lining must be renewed, cartridge-type removal is easy — replacement takes minutes. The pump itself need not be moved.

Remember — Allis-Chalmers can supply the complete pumping unit of pump, motor, drive and control. Contact your nearby A-C district office or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

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A-5231

Wyoming *(Continued)*

copper, gold and silver deposits at the Kurtz-Chatterton mine, 7 miles southwest of Encampment, at $11.7-million.

Trans-State obtained a 99-year lease on eight claims patented in 1904 and has acquired an option on adjoining properly. The claims were leased from Mrs. Nellie Johnson, New Braunfels, Tex.

Trans-State said surveys indicated there are 750,000 tons of 3% copper with small amounts of gold and silver in the deposits.

It will take at least 2½-years to build a beneficiation plant if Columbia-Geneva division of U. S. Steel Co. decides to develop the low-grade iron ore deposits near Atlantic City.

Worrell Pruden, chief engineer for Columbia-Geneva, made the construction estimate while inspecting the ore deposit.

Contractors interested in constructing the plant were invited by Columbia-Geneva to inspect the site early in October.

Pruden said Columbia-Geneva expects to decide by April 1, 1958, if it will develop the area. Ore from the deposits would be concentrated at a $16-million mill proposed at Atlantic City for shipment to U. S. Steel Co.'s mill at Provo, Utah.

Lucky Mc Uranium Co. will double its excavation program to remove overburden on its Gas Hills deposits in the next two years, A. V. Quine, general manager, announced.

Quine said Lucky Mc moved 2-million cubic yards of overburden this summer to bare ore deposits for strip mining. He said Lucky Mc plans to move 3-million yards next summer and another 4-million yards in 1959.

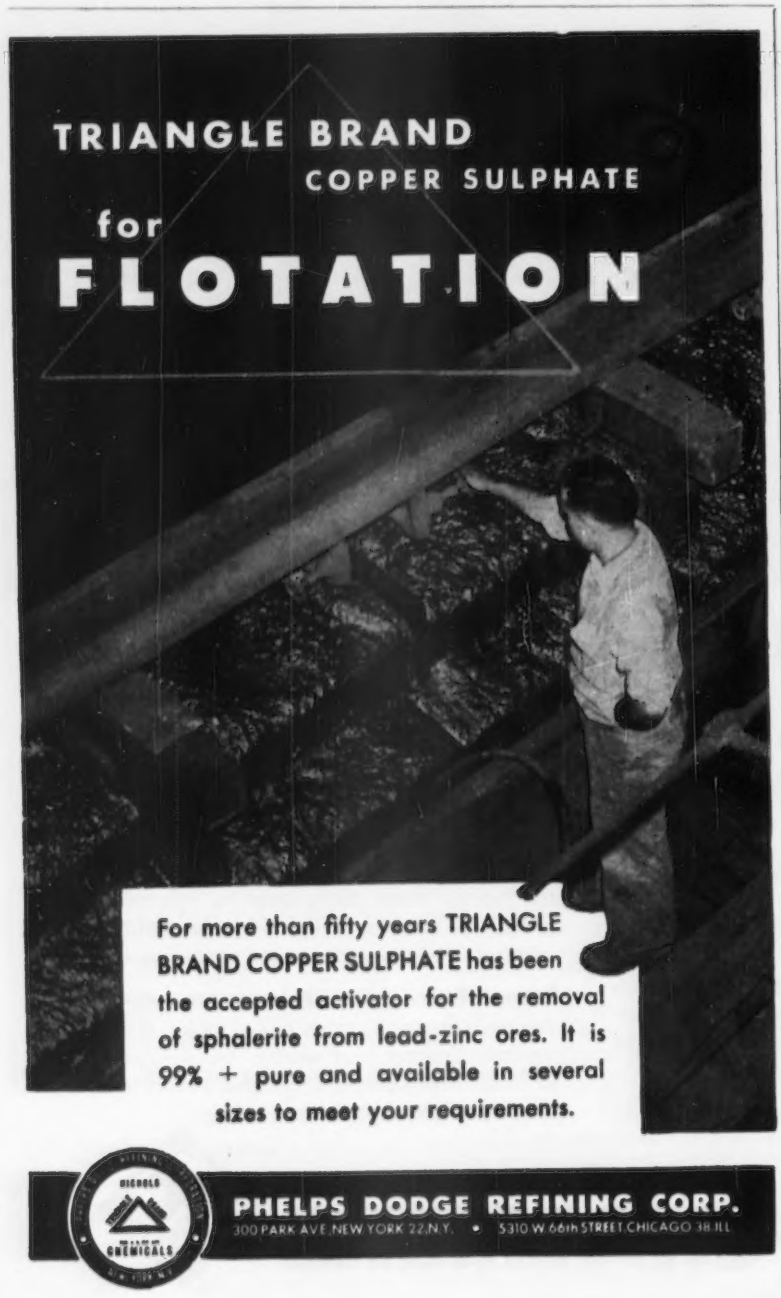
If the AEC approves Lucky Mc's request to increase capacity of its 8-million dollar mill now under construction, Quine said the dirt moving program will be stepped up even more. Lucky Mc has asked AEC authority to increase capacity of the mill from 750 to 1750 tpd.

Sen. Frank Barrett (R-Wyo.) has suggested that the AEC be asked for emergency funds to help improve access roads from Casper, Riverton and Jeffrey City, into the uranium booming Gas Hills.

A delegation of Riverton and Casper mining and civic leaders had asked that a 50 to 53 mile stretch from Lucky Mc mill site to Riverton, a 31-mile stretch from Waltman to the Gas Hills and a 24-mile road from Jeffrey City to the Lucky Mc mill site be surfaced.

Sen. Barrett said the AEC had fostered the rapid exploration of uranium deposits and "should follow it up by providing funds for access roads and authorizing enough mills to handle the development."

Wyoming Highway Commission stated that no funds would be available for the state secondary road system until July 1958.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IN CANADA

ONTARIO

Good results are being achieved in depth development at the gold producing properties of Hugh-Pam Porcupine Mines and Broulan Reef Mines in the Porcupine area. On the Hugh-Pam 1720-ft level over 130 ft of ore has been opened. Average from chip samples along this length is 1.65 oz gold per ton, and from muck samples 0.55 oz. Downward extension on the 1870-ft level provided 352 ft grading 0.73 oz on chips and 0.32 oz on muck samples.

On the 2,030-ft level, a length of 501 ft has been drifted for an average of 0.48 oz from chip sampling and 0.41 oz from muck sampling. This drift is still in ore. Two deeper levels at 2200 and 2350 ft are to be opened. Deepest work on the Broulan is at 1870 ft. Drifting is in progress on this level to open a possible new zone indicated by diamond drilling about 2500 ft east of the shaft. The Hugh-Pam property is managed and operated by Broulan Reef.

Pronto Uranium Mines, the pioneer uranium producer of the Blind River area, is planning to expand its underground workings. Shaft is being deepened from 591 to 1,000 ft to provide two additional levels bringing total to seven. The mill is

Ontario *(Continued)*

area, is scheduled to start its 3,000-tpd

tion. Northspan holds a contract for sale

Two new Mack diesels recently purchased by Gypsum, Lime and Alabastine, Canada, Limited, for their quarry operation at Beachville, Ontario. *(Left)* Dumping the 15-ton payload of an Easton trailer into the crusher chute.

"26 years of unmatched performance"

That's the way Mr. R. S. Adams, Plant Manager at Beachville, explains his company's preference for Macks. "Ever since 1931, when we purchased our first Macks—AC models equipped with hard tires—we have used Macks almost exclusively. Our old AC's operated until 1942. At the present time, we have eight Macks in daily operation—five diesels and three gas-powered. The diesels, of course, have been very successful, and eventually we will use them exclusively for stone hauling."

Here's a company that's sold on the stamina and inherent hauling economy of Macks—has been for 26 years. They know that they can depend on Macks. And little wonder! Today's Mack engines often exceed 200,000 miles before overhaul . . . frames, axles, and transmissions are built to withstand a million miles and more.

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Ontario *(Continued)*

running at capacity of 1,500 tons daily, with grade being maintained at from 2.4 to 2.6 lb uranium oxide per ton. Recovery is close to 90%. Mining has been confined to the three top levels with operations on the fourth level expected to get under way shortly.

Northspan Uranium Mines is tuning up the first 2,000-ton unit of the 4,000-ton milling plant at its Lake Nordic uranium mine in the Blind River area. The second unit of 2,000 tons is expected to be in operation by year end. The Panel operation, the company's second mine in the area, is scheduled to start its 3,000-tpd capacity mill late this December. A third mill of 2,000-tpd capacity is currently being constructed at the company's Spanish American mine, which is expected to start production next spring. Ore from the Spanish American Buckles property is being treated at the Lake Nordic mill. Official estimated reserves at the four properties are: Buckles, 235,000 tons averaging 0.106% uranium oxide of 2.12 lb per ton; Lake Nordic, 8,289,207 tons grading 0.101%, or 2.02 lb per ton; Spanish American, 6,251,726 tons averaging 0.097% or 1.94 lb per ton; Panel, 5,764,889 tons averaging 0.108% or 2.16 lb per ton—all values after dilution. Northspan holds a contract for sale of $275-million worth of uranium oxide concentrates with Eldorado Mining and Refining.

Consolidated Sudbury Basin Mines has decided to delay start of production at its base metal property in the Sudbury area. Low metal prices, the high premium on the Canadian dollar and uncertainty about U.S. tariff policy are given as reasons for the decision.

The Noranda Mines' controlled Porcupine gold producer, Aunor Gold Mines, is gradually increasing its mill rate from 500 to 750 tpd. The mill has been increased to 600 tons at present with full rate expected to be reached by next summer. Work has largely been completed in preparation for the development of deep levels below 2,125 ft.

Production operations are progressing smoothly at Geco Mines, Canada's newest copper producer. The plant at the Manitouwadge area property is currently handling some 2,000 tpd. Capacity operations of 3,300 tons is scheduled to be reached shortly. Shipments of concentrates, started about mid-September, are continuing satisfactorily. Estimated ore reserves at start of production were estimated at 15,227,251 tons averaging 1.76% copper, 3.48% zinc and 1.77 oz silver per ton. Company is controlled and managed by the Mining Corporation of Canada.

Fatima Mining Co. plans to carry out underground exploration at its nickel property south of Timmins. A 3-compartment shaft is to be sunk to depth of 500 ft with 2,500 ft of crosscutting and drifting and 1,500 ft of raising to follow its completion. In the meantime surface diamond drilling will be continued. According to an official, some 2,800,000 tons grading about 1.15% nickel has been indicated by drilling in a block 500 ft long by 700 ft deep. The indicated zones are still open along strike and down dip.

QUEBEC

Noranda Mines has placed the third reverberatory furnace in operation at its copper smelter at Noranda. The new furnace, the main item in a major expansion program which has been in progress since early 1956, permits substantial increase in custom copper output. Present production is about 100,000 tons annually, of which 75,000 tons represents custom business. It is anticipated that output will exceed 130,000 or 135,000 tons per year when capacity operations are reached.

Shaft sinking and development programs have been approved by directors of Marchant Mining Co. on the nickel property in the Val d'Or-Malartic district. Shaft, a 3-compartment vertical opening, is to go to an initial depth of 600 ft to provide three levels, at the 150-ft, 300-ft, and 450-ft horizons. Indicated tonnage is estimated at over 225,000 tons averaging better than 2% nickel.

Diamond drilling at the Watson Lake

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Brunner & Lay carbide Rok-Bits in these body types—cross, chisel, "X", cutaway, taper socket. Furnished in standard wagon drill and hand held drill threads—600, 400, 200 and J-7.50 threads. Bit sizes up to 6½" in our Hole-Master.

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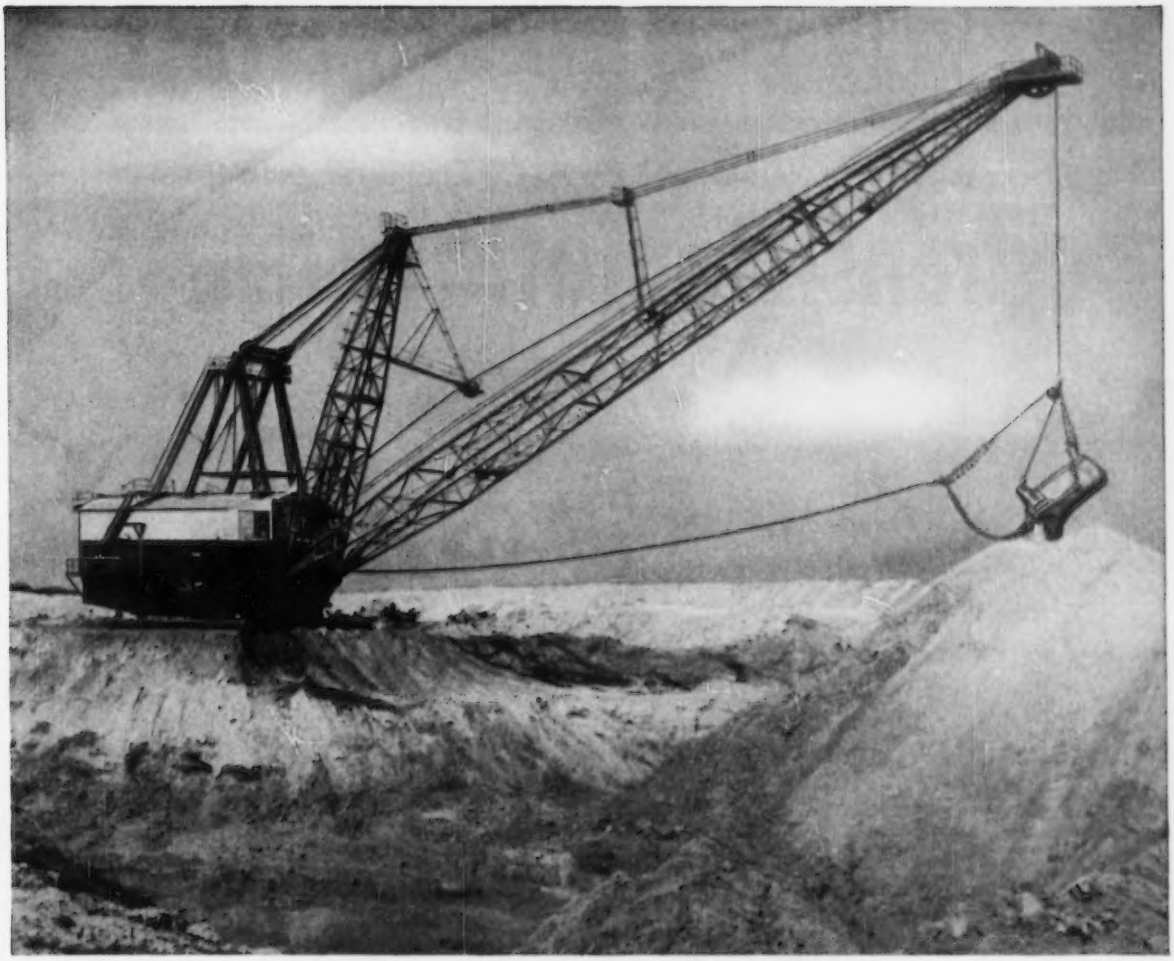

This Bucyrus-Erie 770-B walking dragline is mining phosphate matrix near Bartow, Florida. It swings a 20-cu. yd. bucket on a 195-ft. boom.

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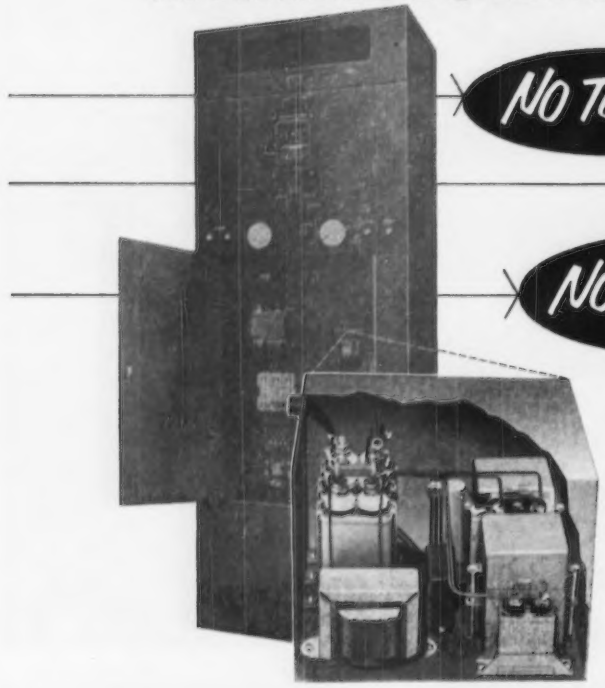

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Compare DEPENDABILITY! The "Transistomatic" unit contains no parts of any kind requiring regular replacement. Moreover, the entire unit is completely sealed—moisture-proof and watertight.

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Photo symbolizes Permutit's two-fold interest in ion exchange metallurgy: project engineering and resin technology.

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Five out of seven of the top-producing U. S. uranium mills using the resin-in-pulp process now depend on Permutit SKB ion exchange resin. Permutit SKB provides high uranium capacity and efficient recovery under production conditions. It was developed by Permutit polymer technologists especially for uranium extraction.

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Available in 3 to 12 tons: 42 to 48" high, 18 to 56½" track gauges.

Greensburg's dependable performance results in operating economy. Advanced engineering design and custom-building to specifications give Greensburg Locomotives up to 20% more efficiency and longer battery life than any other storage battery locomotive of equal weight and battery capacity. More earning power per dollar invested!

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"Best in the West for Uranium Testing!"

Acker Teredo Core Drills operating on the Colorado Plateau have already "been-in" on some of the biggest uranium strikes in the West!

There's a reason! They're lightweight, yet designed and built to stand-up under the most rugged conditions. Your choice of power plant and mounting on trailer or small truck.

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ACKER DRILL CO., INC.

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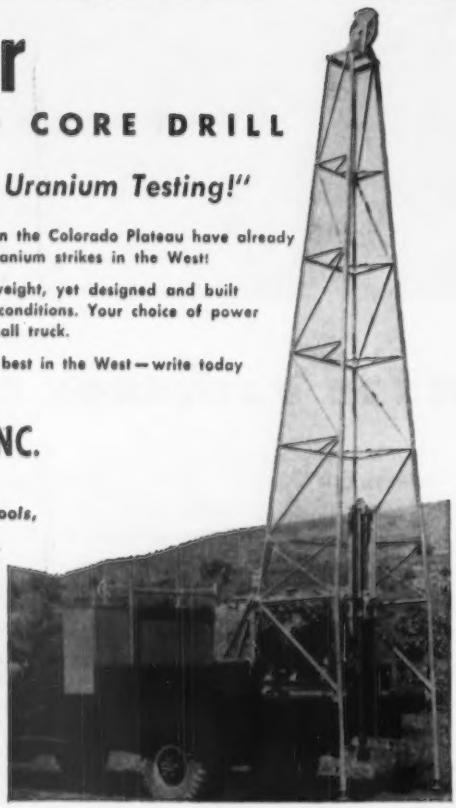
a complete line of Soil Sampling Tools, Diamond and Shot Core Drills, Drilling Accessories and Equipment



Here's one of the portable, self-contained Acker Teredo Drills already in use on the rough, remote terrain of the Colorado Plateau. A built-in water supply tank permits this rig to operate anywhere!

Quebec *(Continued)*

base metal discovery of Mattagami Syndicate is confirming original estimates of substantial tonnages. Although no official estimates have been prepared, it is suggested that upwards of 10-million tons have been indicated in the first 16 holes, with grade in the range of 10 to 12% zinc, 0.75% copper, plus additional values in gold and silver. Structure has been outlined along a length of 1100 ft, still open at both ends.

The No. 2 shaft at the copper producing property of Rainville Copper Mines in the Val d'Or area has been completed to depth of 1113 ft. Lateral work to the No. 2 ore zone has been started on the 240, 400, and 550-ft horizons. Exploratory drilling has been carried out in the No. 2 area, results as follows. On the 700-ft horizon, a 200-ft length grading 1.23% copper has been indicated across average width of 37.8 ft. On the 400-ft level, 200 ft grading 1.81% over average width of 26.6 ft was indicated. On the 240-ft level only narrow and scattered intersections have been obtained.

Asbestos producers in the Thetford Mines-Black Lake and Asbestos areas, Eastern Townships, are making excellent progress in their bid to expand production and maintain their world lead. New construction, including new plants and extensions to existing plants, is expected to increase rated capacity of mines in the area by some 11,500 tons to around 59,700 tpd. The major portion of Canada's asbestos output is produced in this area. Canadian Johns-Manville, which is nearing completion of a $2-million expansion program, accounts for about 55% ot total Canadian tonnage. Next in line is Asbestos Corp., which is also engaged in expansion and renovation programs. Other producers, all large operations, include Nicolet Asbestos, Bell Asbestos, Johnson's Asbestos, Flintkote Mines and Quebec Asbestos Corp.

A new ore structure, carrying rich values in gold plus appreciable amounts of colbalt, has been indicated by diamond drilling at the copper producing property of Opemiska Copper Mines in the Chibougamau area. Drilling has indicated upwards of 200,000 tons averaging 2.89% copper and 0.7 oz gold per ton. No average was estimated for cobalt due to erratic assays. Structure has been traced by drilling over a length of 1,300 ft with vertical extent of 450 ft between the 535 and 957-ft levels. Average width is 3.5 ft. Vein is still open on strike to the east and to depth.

Barvue Mines has suspended operations at its zinc property at Barraute, some 40 mines north of Val d'Or. Low price of zinc was given as the reason. The 5,300-tpd capacity concentrator was placed in operation in November 1952. Mining was carried out from open pit until late last year when operations were changed over to underground.

Department of Mines of the Province of Quebec has released two preliminary geological reports:

WIRE ROPE AT WORK

Here is a drum of wire rope that obviously means business. It's a husky 1½-in. Bethlehem line, and there's approximately 6,000 ft of it. Everything about the installation points to heavy-duty service. Everything also suggests careful maintenance and good housekeeping.

The rope is one of several that Bethlehem has furnished Kaiser Steel Corp. for slope haulage work in its No. 1 and No. 2 Sunnyside Mines, Sunnyside, Utah. It's a Purple Strand rope, Bethlehem's top grade, and it never asks how tough the loads will be. A dependable workhorse, it is being counted on to handle tremendous tonnages during its lifetime at Sunnyside.

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Deep in a wilderness along the border between Labrador and Quebec, several Marion 4161 electric shovels load out high-grade iron ore to help feed steel furnaces all over the world. These 6-yard machines operate 12 months of the year —giving high output with minimum downtime in temperatures that fluctuate from summer's average 65° above zero to winter's average 20° below.

Heavy-duty construction of this ¾-yard Marion 35-M shovel matches the ruggedness of larger machines in the Marion line. For loading out coal—for any tough job—you need a durable machine. And there's a Marion to meet your need.

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In existence for over 50 years, Elektrokemisk has served as consultants and constructors of smelting plants and aluminum reduction cells.

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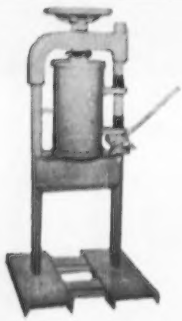

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Quebec *(Continued)*

P.R. No. 344, on the St. Etienne de Bolton area: Covers 22 square miles in Bolton and Stukely township, about 25 miles southwest of Sherbrooke. In Bolton township there are several occurrences of asbestos.

P.R. No. 349, on the Manitou Lake area, which lies about 65 miles northeast of Sept Iles and covers 190 square miles of Saguenay county. Some development work has been carried out on three zones of magnetite-rich rock, averaging more than 50% iron, that occur as conformable lenses in injection gneiss.

Due to drop in copper prices during the current year, Duvan Copper Mines has decided to suspend operations at its copper property in Desmeloizes Twp., Normetal area. No further exploration work is planned for the present.

NEWFOUNDLAND

Maritimes Mining Corp. has settled down to regular production at its copper mine at Tilt Cove. Since the start of milling late in August, mill rate has been working up to capacity of 2,000 tpd. Mill feed is running around 2.1% copper. Under a seven-year agreement, Gaspe Copper Mines smelts the copper for later finishing at Canadian Copper Refineries at Montreal East. As by-products of the operation, a small amount of gold is recovered as are pyrites. Property is situated at tidewater and the dock, which will take ships up to 10,000 tons, is located within conveyor distance of the concentrate storage shed beside the mill.

Advocate Mines, which holds ground adjoining Maritimes Mining Corp. in the Baie Verte area, has increased its estimates of asbestos tonnage and value and has uncovered interesting base metal possibilities. Asbestos tonnage is now estimated at 30-million tons having a gross value of $245-million at $8.17 per ton. Twelve miles south of the chief asbestos development, interesting showings of lead and copper have been made. Mineralization has been located over a width of 40 ft and at intervals along a length of 1500 ft. Drilling is planned to test the occurrence. In another section of the property a strong shear with indications of lenses of good grade copper, has been traced for 3,000 ft with width in places up to 1,000 ft.

Atlantic Coast Copper Corp., jointly owned by O'Brien Gold Mines and New Highridge Mining Co, is sinking a 1,000-ft shaft at its Little Bay copper property. A minimum of 2-million tons, grading 2.1% copper, was outlined by previous diamond drilling. There is also an estimated 200,000 tons, grading 1.5% copper, on the surface dump from previous operations.

BRITISH COLUMBIA

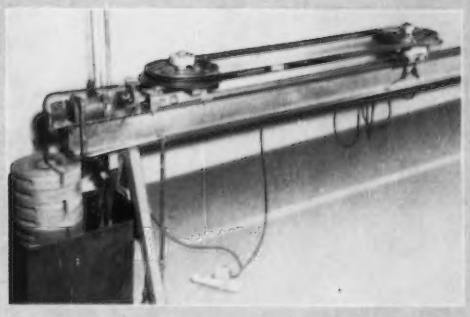
First shipload of iron concentrate from

for driving reliability...

New **4-STEP** matching program gives

TEXROPE BELTS

even greater efficiency



Step 1 — Immediately after manufacture, every Texrope belt is accurately measured on modern equipment and its length is coded on the belt.

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Step 3 — Distinctively colored tags are used to mark each matched set, thus assuring you true performance on multiple V-belt drives.

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A-5402

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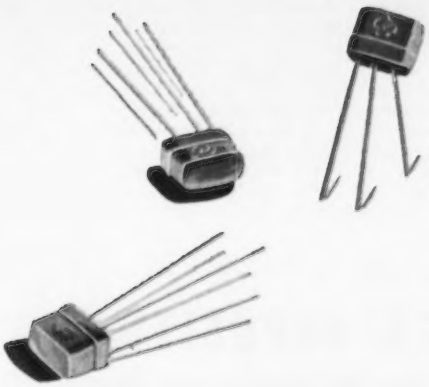

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Again Sulphur, through its major derivative, Sulphuric Acid, and a natural sulphide play an important role in our ever-expanding economy. It is difficult to find many items in the broad chemical-metallurgical field that do not somewhere along the production line make use of Sulphur or a derivative.

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NEW BEE-ZEE BH LOOP SCREEN is non-rigid to prevent clogging. Short, individual screening rods are looped – not welded – around tie-rods. Spacing is controlled by washers slipped between loops.
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LOOP

To give mine operators a solution to extreme clogging problems, Bee-Zee engineers produced a new type of screen operating on entirely new principles. Bee-Zee's BH Loop Screen is made up of "loose" segments that multiply the action of a vibrator. Clogging is prevented without distorting accuracy.

Whether your own screening problems are highly unusual or "run-of-the-mine", Bee-Zee Screens can provide the answers – and make you money. Screening rods can be round, triangular or specially shaped. Electronically controlled welding fuses them to tie rods to form screens in all shapes, sizes and dimensions. Type or make of screening equipment is never a problem.

Write, wire or phone Galesburg 4397. Ask for a specific recommendation or one of the complete Bee-Zee catalogs – or both.

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ENGINEERING COMPANY
5117 Abingdon Street, Galesburg, Illinois

Peru Schedules $7-Million Acari Iron Mine

DEVELOPMENT of the Acari iron ore deposits south of Lima will start in January, according to officials, with the construction of a new pier at San Juan Bay and a 31-mile highway connecting the port and the mine. Construction time of facilities for ore shipment is estimated at some 18 months at a cost of $7-million.

Acari deposits, being developed by Panamerican Commodities S. A., Lima, with U. S. financing, are located some 375 miles south of Lima in the Andean foothills, 35 miles east of the 600 square km iron ore concession of the Corporacion Peruana del Santa, now being exploited under a long term agreement with the Marcona Mining Co. in which Utah Construction Co. and the Cyprus Mines Corp. are share-holders.

Acari mining claims comprise 60,000 acres of ore-bearing land on which Panamerican Commodities has located some 12 veins of high grade magnetite ore running from 60- to 70% iron. In No. 1 vein alone, an estimated 30-million tons of ore have been blocked out. Mines are located some 18 miles from the Pacific Coast port of Lomas, which is south of the Marcona Mining Co. port of San Juan.

Acari deposits are located at elevations ranging between 2,500 and 3,000 ft above sea level. Unlike the Marcona concession which is located on fairly level land, Acari is in the foothills of the Andes. Total extent of the mineralized area, commercially exploitable, has still to be determined, the immediate plans for development being based on the ore now blocked out. First shipment is expected to be around mid-1958 at a rate of 1-million tons per year, gradually increasing to 3-million tons per year, all facilities and installations being geared to handle this amount.

For the development and operation of the Acari mine, Panamerican Commodities has formed a new concern, Compañia Explotadora de Hierro de Acari.

B. C. *(Continued)*

Empire Development Co. Ltd.'s new mine at Port McNeil on Vancouver Island is now heading for Japan. When in full swing, the open pit operation will employ 100 men and expected output will be 1,700 to 1,800 tpd.

The Canadian Arctic will be surveyed by aerial photography next year, according to announcement by the federal Department of Mines.

Vancouver firm of Aero Surveys Ltd. will map the western area of the 50,000 square miles between North Pole and 70th parallel.

The $6-million survey, scheduled to last six years, will complete an aerial picuture of Canada that has so far been 10 years in the making.

The operation will be tied in with an RCAF Shoran radar measurement completed last June to furnish the basis for detailed mapping of Canada's Arctic area. One of the reasons for the survey is to investigate opportunities for mining.

Confirmation that Japan is giving serious consideration to the purchase of large quantities of British Columbia coal, providing the price is right came last month from Dr. Toru Hagiwara, newly appointed Japanese ambassador to Canada.

"We need coal badly for our steel and chemical industries," said Dr. Hagiwara while attending a seminar on Japan at the University of B.C.

Beaver Lodge Uranium Mines this month revealed two major developments involving the Highland Valley and a Colorado property.

Beaver Lodge president D. F. Farris, reports that an agreement has been signed by Northwestern Explorations Ltd. (Kennecott Copper subsidiary) and Krain Copper Ltd., a wholly-owned subsidiary of Beaver Lodge and Farwest Tungsten Copper Mines.

At Idaho Springs in Colorado, Beaver Lodge holds control of a gold, copper, silver, lead property that is expected to be in production next spring.

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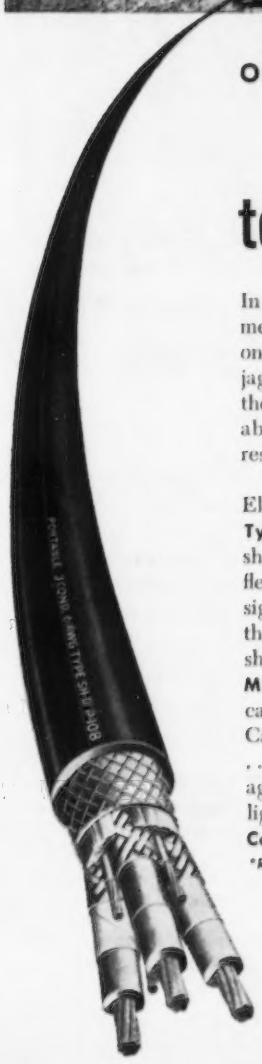

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Mining Machine Cables, Types W and G—Designed for especially severe conditions, such as being dragged behind mining machines, hit by picks, run over by equipment. Is exceptionally flexible, resilient, and abrasion-resistant.

FOR FULL INFORMATION on how G-E cable can help you, write for complete data on the G-E line of wire and cable. Just address Section W215-1195, Wire and Cable Department, General Electric Company, Bridgeport 2, Conn.

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Size in Rollway Thrust Bearings—big or little—is a mere matter of operating "geometry" and of the machinery to produce it. But design, precision and quality are dimensionless quantities that vary widely according to loads, speeds, temperatures . . . yet in the end sum up to a single constant: *"To do the job required in the one best way."*

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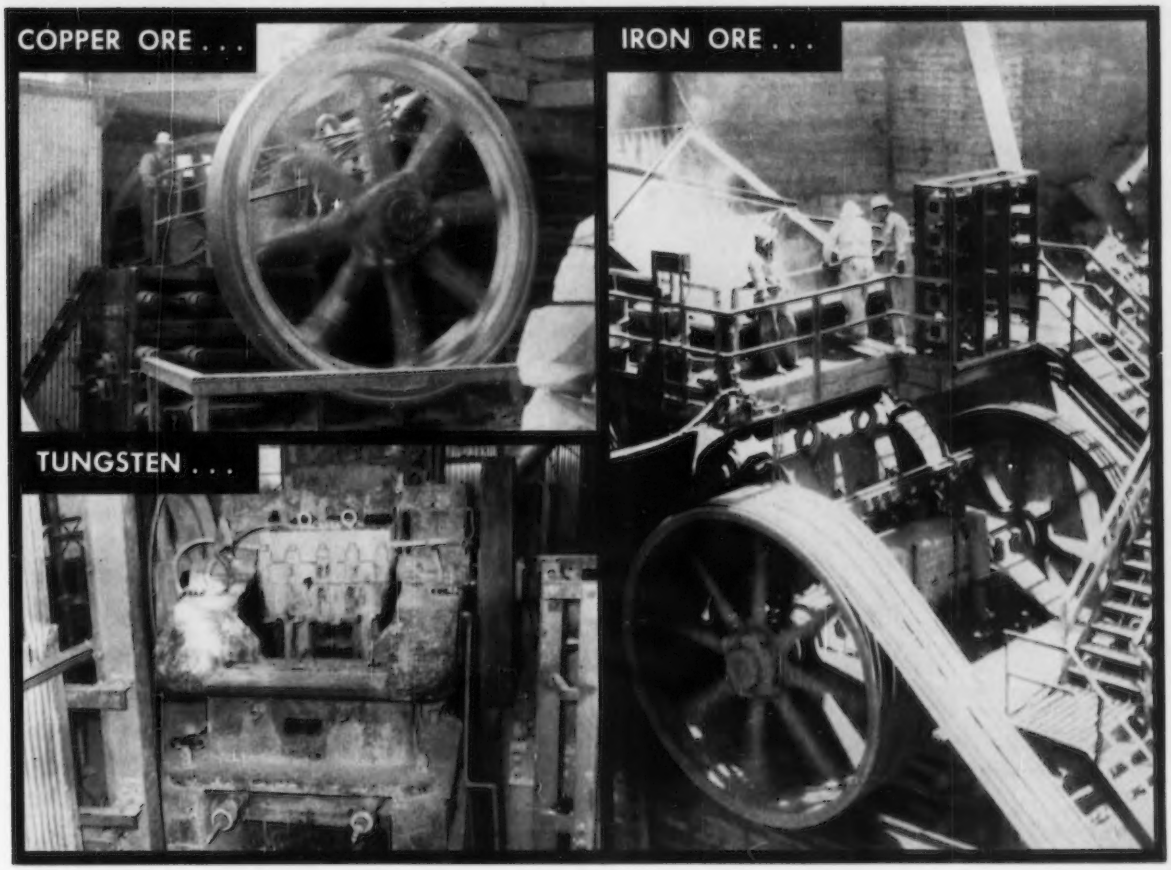

BIRDSBORO-Buchanan Primary Jaw Crushers Pay Off On the Job with New Production Records

On a remarkably wide range of materials, BIRDSBORO-Buchanan Crusher owners throughout the world are speeding up their operations because of outstanding primary crushing service. Iron ore production increased at a mine in Peru; copper ore is being processed at a considerably faster rate in Arizona; and in North Carolina, a leading Tungsten producer turns out record totals daily with an 18″ x 36″ model . . . all with special design BIRDSBORO-Buchanan primary jaw crushers. Low maintenance, and continuous, dependable service make them economical, too. Your nearest Birdsboro representative can translate these benefits into greater efficiency and profitability for your operation. Call him in and see how it can be done, or write to: Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., *District Office:* Pittsburgh, Pa., *Subsidiary:* Engineering Supervision Co., 120 W. 42nd St., New York 36, N. Y.

World-Wide Agent Representation. Contact home office for nearest representative. *Canadian Representative & Manufacturer:* John Inglis Co., Ltd., Toronto, Canada.

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ORE TRUCKS, with drivers riding backwards, leave shovel area at the mountain top.

Paz del Oro Feeds $20-Million Steel Plant

A PROVED DEPOSIT of 100-million tons of iron ore is being used by Paz del Rio of Bogota, Colombia to feed its steel mill, located at the mine site in the South American Andes. Property, 162 miles north of Bogota, also contains a reported 2-billion tons of coal and 65-million tons limestone.

In full production since last year, the plant has been concentrating upon production of steel rails for the 468-mile Bogota-Barranquilla-Cartagena railroad. In addition, the plant turns out some 20,000 tons of agricultural lime, 3,000 tons of ammonium sulphate and 27,000 tons of phosphoric slag each year. Property has been turned over to private enterprise by the government.

B. C. *(Continued)*

Cariboo Gold Quartz Co. Ltd. reports its French Mine at Hedley is operating satisfactorily with grades running .9 oz gold. Company expects production to be around 40 tons of concentrates daily.

Consolidated Mining and Smelting Co. has established sufficient ore reserves at Pine Point, on the southern shore of Great Slave Lake, to assure long term profitable operations as soon as transportation problems have been solved.

Sheep Creek Mines Ltd. reports the No. 5 level drift at the Mineral King Mine now is 165 ft in good lead-zinc ore.

The ore has averaged 6% lead and 5% zinc for this length, considerably higher than the "A" orebody, chief source of ore for the mill to date.

Western Mining Co. Ltd. reports work has started on a new $250,000 depth program to be carried out over an 18-month period at former silver-lead-zinc property near Silverton in the Slocan mining division.

Kaslo Mines Corp. of Spokane, Wash. has had crews busy all summer at its silver-lead-gold-copper prospect near Howser. H. G. Loop, president, said two cave-ins in the main tunnel were cleared up. He said five shallow surface tunnels were cleaned out, and trenching is now under way along the vein system outcrop.

Sheep Creek Mines says its Mineral King mine near Invermere can operate profitably at 14c a pound for lead and 10c a pound for zinc if the duty on concentrates is not hiked by the U.S.

A company report said the new number 5 level drift has been in ore for 165 ft and has averaged 6% lead and 5% zinc. Orebody was 45 ft thick where pierced by a raise from the new number 7 adit level to the number 3 level.

In Highland Valley, Minex Development Ltd. reports it is negotiating with a big (but unamed) United States mining firm to option Minex's 24 copper claims and work an additional 20 claims.

Minex president John A. Hallberg said the U.S. company has already started preliminary mapping of the property straddling the axial line of the Guichon Batholith (and situated between Bethlehem Copper Corp.'s property under development by American Smelting and Refining Co.) and the holdings of Jericho Mines Ltd., under development by Phelps Dodge.

ALBERTA

A sharp drop in lost-time injuries despite increased man-hours of exposure at the nickel refinery of Sherritt Gordon Mines Ltd., Fort Saskatchewan, has been traced to results of an intensive safety program during the last three years.

The company announced that the entire organization has now completed more than one half million man-hours of work without a lost-time injury.

LABRADOR

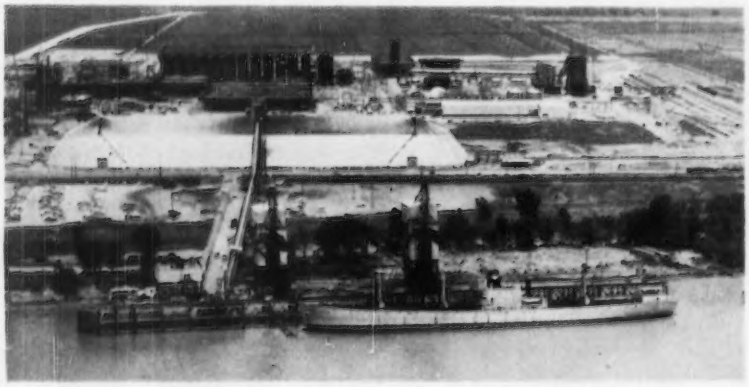
Test drillings of a uranium orebody on the coast of Labrador was announced at the September annual meeting of British Newfoundland Corp. Ltd.

Brinco chairman, B. C. Gardner, said the discovery was on the company's lease area near Kaipokok Bay, 125 miles northeast of Goose Bay. Diamond drilling was started in early September after a summer of concentrated surface work.

IN LATIN AMERICA

CHILE

Copper's continued price fall is beginning to be felt by medium sized mines, most of which are fairly high cost producers. Small copper mines have not yet been seriously affected because all of their ores and concentrates go to the Mining Credit Bank which has been able to maintain a fairly good buying schedule by borrowing money from the govern-



PRODUCTION IS DUE late this year from Kaiser Aluminum & Chemical's $70-million alumina plant at Gramercy, La., on the Mississippi River. Bauxite from the company's mines in Jamaica (*E&MJ*, September 1957) is unloaded mechanically and conveyed to the storage bin in the foreground. Digesters and precipitators are under construction in the background.

Mining Gold in the Black Hills

That's Bethlehem Hollow Drill Steel biting into hard, tough pre-Cambrian schist in the Homestake Mine at Lead, South Dakota—the largest gold mine in the western hemisphere.

The Homestake Mine, operated by Homestake Mining Company, has been active since 1877. It is now about 5600 ft deep, and has 25 working levels. Because of the hardness of the rock, drilling is extremely difficult. The cut and fill method is employed, with rock tailings used for fill. Bethlehem Hollow Drill Steel, fitted with carbide-insert bits on $\frac{7}{8}$-in. hexagon rods, is widely used throughout the workings. It's been giving an excellent account of itself, too. Reconditioning is done top-side, in Homestake's modern shop.

Bethlehem Hollow Drill is economical for all kinds of rock drilling jobs because it is rolled from fatigue-resistant steel, and has a uniform hole, centrally located in the bar. It also has a wide quenching range. Moreover, it is easy steel to heat-treat for the proper balance of toughness and wear-resistance, making possible long-wearing threads and strong shanks.

Bethlehem Hollow Drill Steel comes in Carbon and Ultra-Alloy grades in rounds, hexagons and quarter-octagons. It is regularly furnished in lengths of from 18 ft to 27 ft, though longer lengths can also be supplied. Specify Bethlehem Hollow the next time you order drill steel.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
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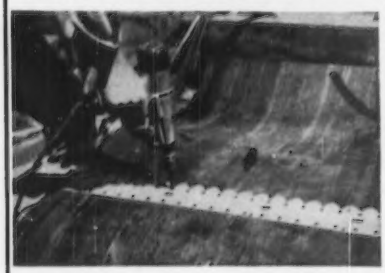
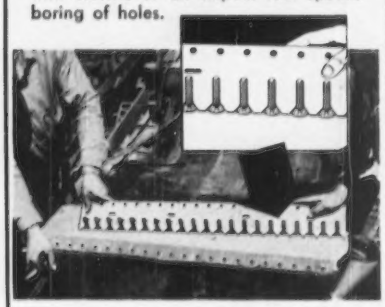
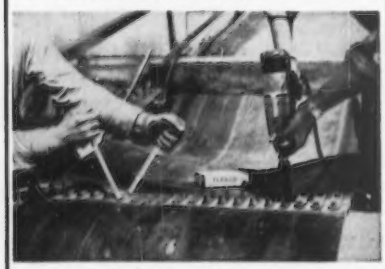
Your two man belt team can now join a belt 30" wide in 15 to 20 minutes . . . using the new FLEXCO Power Tools.



The FLEXCO Power Tool Boring Bit used with electric or air impact tool speeds boring of holes.



New FLEXCO Templet positions bolts for quick joining of belts. Reaching under belt has been eliminated.



Running down nuts is fast with the new FLEXCO Power Wrench used with electric or air impact tool. Two Bolt Breakers are used together to complete the joint.

If you are interested in speeding up fastener application, order the new Power Tools from your local FLEXCO Distributor. Write for Bulletin F-112-A.

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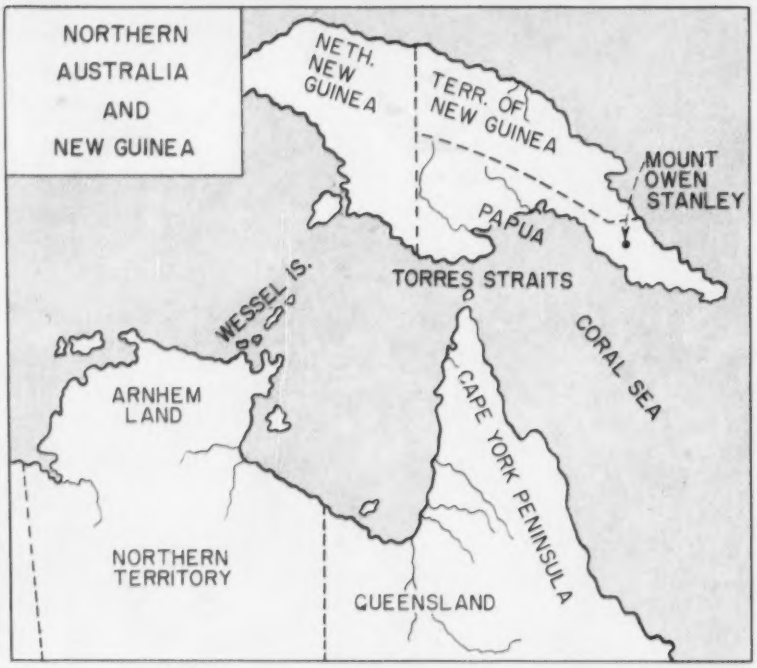


STATE GOVERNMENT of Queensland has approved the franchise for development of the rich Cape York Peninsula bauxite field. Mining rights have been granted to the Consolidated Zinc Corp. which has undertaken to proceed with at least the first stage in the processing of the area's aluminum ore. (*E&MJ*, July 1957, p 126)

Chile *(Continued)*

ment owned National Smelters Corp., Central Bank and the State Bank. However, many of the small miners in Atacama province who own both copper and iron claims have been slowly shifting from copper to high-grade iron mining and the tendency is bound to continue.

Santiago Mining Co., an Anaconda subsidiary, has completed the first 250 tpd unit of its La Africana flotation mill located 15 miles west of Santiago. Mill will treat the Africana vein sulphide copper ore which has total reserves of some 3¼-million tons of 3.2% copper ore.

Compania Minera Tamaya, which has been developing the high grade chalcopyrite-pyrrhotite orebody of Las Chivas in Azen province, has found another similar copper deposit. Grade of both deposits is about 13% copper.

ARGENTINA

A total of 102 discoveries of exploitable nuclear mineral deposits have been made in Argentina since the start of a system of monetary rewards for such finds, the government has announced. Sixty three were found by private prospectors and thirty nine by the Argentine Atomic Energy Commission.

Export of lead in ingots has been authorized by the Argentine Ministry of Commerce and Industry. Exporters must maintain a stock, in ore or metal, equal to their average production for two months in the quarter preceding the Ministry regulation. They must also be able to fill the needs of their Argentine customers, and submit bids in government tender calls for lead ingots.

An Argentine University wants to go into the mining business and has asked the national government for a 160 million peso (about $8.9-million at the official 18-1 exchange rate) grant with which to start operations.

It all began when a professor from the University of Tucumán recently discovered valuable gold, silver and manganese holdings about 100 km outside Belon in the Province of Catamarca. Mine is believed to hold some 6-million tons of minerals assaying at 12 grams of gold per ton, 170 grams of silver per ton, and about 20% by weight of manganese.

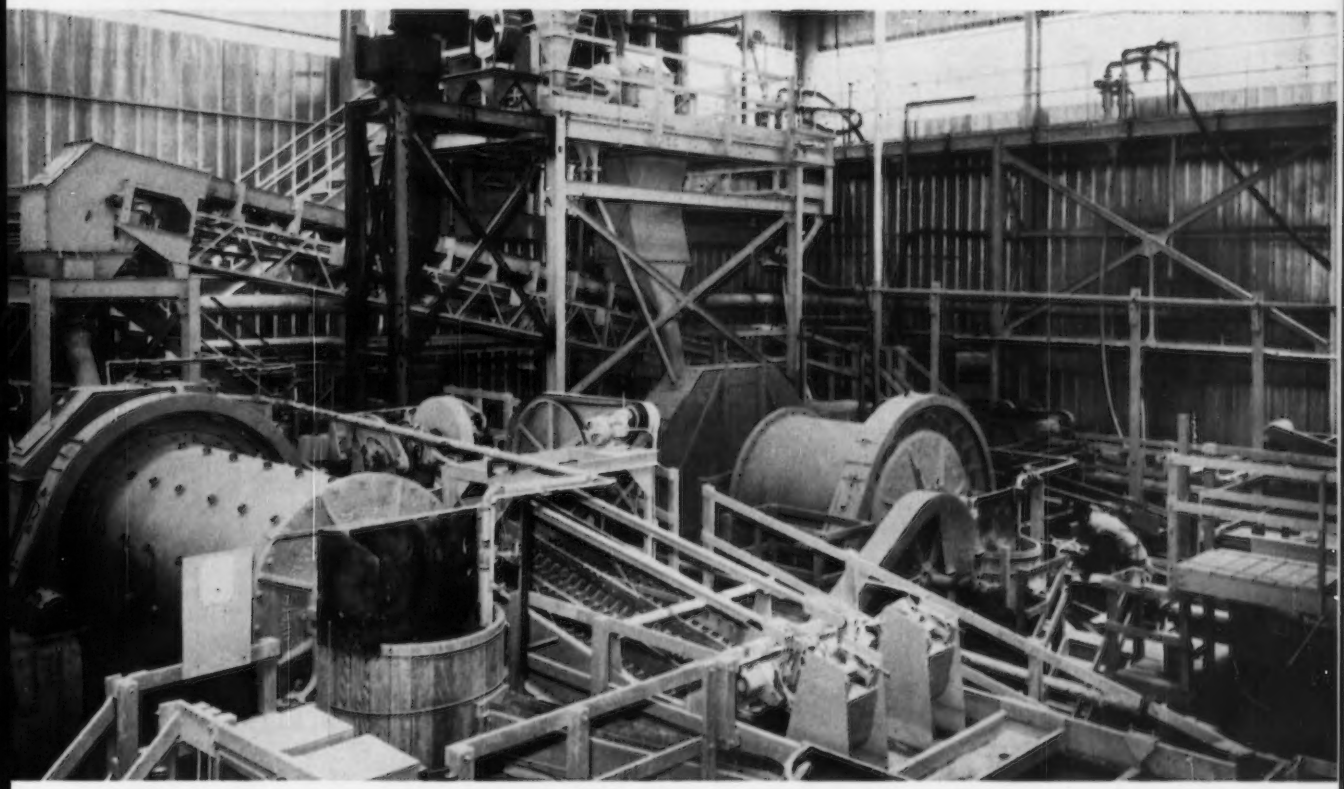
Officials in Catamarca feel that the venture should be undertaken by the province and have requested that an autonomous government be set up to mine these deposits, which are known as the Farallon Negro mines.

Basic price supports for tungsten, beryllium and mica have been set by the Argentine government in a decree dated Sept. 10.

The price for tungsten is 75 pesos ($4.17 at the official 18-1 exchange rate) and this price will be maintained until Dec. 31, 1961.

Beryllium price, until Dec. 31, 1959, is set at 10 pesos the kilo ($0.56) and the mica price, until Dec. 31, 1958 is varying depending on the quality of the

Marcy Engineering
helps solve another milling problem



90% of total Uranium leach obtained in Marcy Pebble Mill

Management personnel of Rare Metals Corporation of America has been very successful in solving many ore treatment problems at its Uranium Concentration Plant near Tuba City, Arizona. Unusual ore characteristics have been responsible for the main milling problems and have limited processing to resin-in-pulp.

They consider the main innovation, in solving these problems, to be the use of a 7′ x 7′ Marcy Pebble Mill specially engineered for grinding in acid. Feed is —1″. Ore, pre-heated water and sulfuric acid are fed into the pebble mill scoop box. The residence time in the mill is only six minutes, but 90% of total Uranium leaching is accomplished within the mill.

Marcy Rod Mill provides flexibility... solves hard ore grinding problem

5 to 10% of the ore is too hard for satisfactory grinding with the soft ore in the pebble mill. Installation of a 5′ x 10′ Marcy Rod Mill provides an alternate circuit for grinding (in water) this portion of the feed. It may be used in either closed or open circuit. As an independent closed circuit, the classifier overflow goes to leach circuit. In open circuit operation, the classifier sands go to pebble mill for finished grind.

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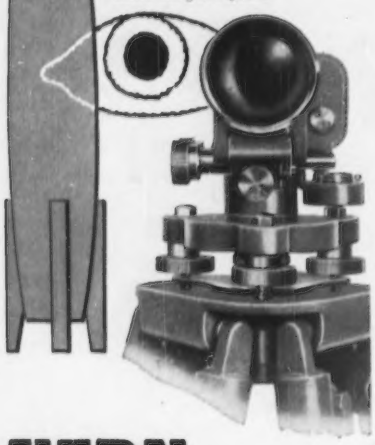

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Argentina *(Continued)*

product.

Same decree also provides for the unrestricted sale of mica beginning on the date of the decree and the unrestricted sale of the other two minerals beginning July 1, 1958.

Mining machinery valued at 70 million pesos ($3.67-million) has been distributed to Argentine mining enterprises in recent months by the state buying organization IAPI, which is now in liquidation, the sub-secretariat of Mining has announced.

BOLIVIA

Bolivia's mineral production for the first half of 1957 valued $28.1-million as compared to last year's first half total of $38.4-million, national officials have announced.

A recent meeting of mining union representatives and managers urgently requested that the Bolivian government spend $8-million to acquire new mining machinery and equipment for the principal mines, including Catavi, Colquiri and Huanuni. Without this investment, delegates declared, it will be impossible to step up production.

BRAZIL

First detailed geological mapping and technical appraisal of iron deposits in the Congonhas District of Minas Gerais, Brazil, has been announced by the U.S. Department of the Interior.

Geological Survey staffmen have been working since 1940 with the Departmento Nacional da Producao Mineral of Brazil to discover new deposits of minerals and to estimate their tonnages. At present, ten USGS fieldmen are preparing detailed geological maps of approximately 2,000 square miles in central Minas Gerais' "Quadrilatero Ferrifero," 200 miles north of Rio de Janeiro.

Survey Professional Paper 290, the "Geology and Mineral Resources of the Congohas District, Minas Gerais, Brazil" by Philip W. Guild, covers about 8% of the Quadrilatero Ferrifero and totals the measured, indicated and inferred reserves of low-grade iron ore in the Casa de Pedra, Sao Juliao and Jeceaba quadrangles at 39-billion metric tons containing 20-billion tons of hemitite or 15-billions tons of metallic iron.

"Of this vast amount," says the author, "about 7.5-billion tons lie within 100 meters of the surface and might be extracted by open cut. Some of this material is sufficiently softened by leaching to be easily minable and can be concentrated by simple beneficiation to more than 60% iron." The average grade is probably near 40% iron, mostly in the form of specular hematite.

Largest company operating in the district is Companhia Siderurgica Nacional, the National Steel Mill of Brazil, with principal mine at Casa de Pedra near Congonhas.

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H10AL Air Leg takes the hard work out of drilling —absorbs shock, advances the drill into the rock.

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One Tool Handles Both Production and Rock Bolting

Le Roi H10AL Air Leg does double duty in typical stoping operation.

Recent design changes reduce wear, ease dismantling

Le Roi's H10AL Air Leg is shown here doing two jobs in a sphalerite stoping operation. Down at the 1900-foot level in a Montana mine, the operator uses both 6- and 11-foot steels while stoping. He makes an 11-foot advance per round in this horizontal breast cut and hydraulic fill stope.

After each blast, he scrapes and bolts the rock walls before drilling the next round. He doesn't need an extra tool. He merely changes the direction of his H10AL Air Leg to quickly and easily handle the rock bolting operation, too.

You can use Le Roi Air Legs as stopers, drifters, or sinkers. They have a full range of drill rotations. An exclusive 11-position feed control allows you to set and maintain any desired feed pressure from 9 psi to full line pressure. That makes it easy to keep lined-up with the hole — reduces front-end wear, eliminates rotation strain — keeps your drill-repair costs down.

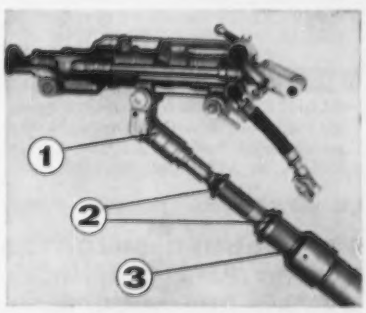
There's no third hose or clumsy "Y" connection. And the Air Leg absorbs the drill recoil. That means an easily handled rig — one that won't tire out the operator, lets him get in plenty of footage with less fatigue.

New Improvements

A sturdy ball-lock connection between drill and Air Leg on recent models permits quick dismantling for easy transportation. This unit is sealed against dirt, and is far stronger than the old bayonet-style construction.

Umbrella drip shields over both pistons keep out unwanted dirt and sludge. Bleed air at both pistons will carry oil to the cup leathers and also prevent dirt from entering the working parts at bushing and piston points. Other mechanical changes and improved metallurgy reduce wear from vibration throughout the entire feeding cycle.

You can choose from several types of Le Roi Air Legs having single or telescopic 3, 4, 5, or 6 ft. feeds. Conversion kits are available to convert older models to the new Le Roi design. Write today for complete information on this useful tool.



(1) Ball lock connection, (2) umbrella drip-shields, (3) sealed dirt-free construction.

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COLOMBIA

Banco de la Republica, the Central Bank, will buy the Colombian gold miners whole production at peso prices as follows: 60% will be paid at the rate of Foreign Exchange Certificates ruling on the date and 40% will be purchased at the free market. This will allow miners to remit at least their profits abroad without difficulties and without stamp tax.

MEXICO

A 150 metric tpd flotation mill began operation in mid-October to concentrate ores from a group of recently reopened copper mines. The mines were first discovered in 1765, worked by a succession of companies, then shut down about 1906.

Cia. Minera de Zomelahuacan recently reopened the mines and began operation of the mill with a reported initial investment of $160,000.

The Zomelahuacan mining district is in the State of Veracruz, 176 miles east of Mexico City. Some 110 men will be employed in the new operation.

DOMINICAN REPUBLIC

Barium Steel Corp. has received Government approved extenison to develop iron ores in the Dominican Republic. Present agreement expires in 1967.

IN AFRICA

200 "lone wolf" prospectors are searching for radioactive minerals in 1,000 square miles of Southern Rhodesian bush country between the villages of Sinoia and Karoi. The "uranium rush" was set off by the United Kingdom Atomic Energy Authority publication of district maps, showing the relative radioactivity of the various areas. Maps were the result of the Authority's aerial survey begun in July.

Southern Rhodesia's new $12-million copper mine, Mangula, 100 miles north west of Salisbury, came into production last month, fifteen months ahead of schedule. The mine is producing copper concentrates—approximately 50% copper—and its output target is 10,000 tons of concentrates a year. At first the concentrates will be exported without further treatment but later the mine plans to build its own smelter. Mangula's proved ore reserves are 22-million tons.

IN AUSTRALIA

Australian output of tungsten in 1957 is certain to fall below the 1956 record figure of 2,281 tons. Falling prices have strongly affected the smaller northern producers.

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Australia *(Continued)*

1957 zircon exports will exceed the 100,000 tons mark but Australian producers are expressing fears regarding a further drop in ruling prices. Established large scale producers in New South Wales and Queensland have considerably increased their output and by-product zircon production by big ilmenite producers in Western Australia is certain to begin before the end of 1958. Actual output throughout Australia is still well below the productive capacity.

The first entirely new copper discovery at Mt. Lyell Tasmania since big orebodies were discovered some 50 years ago has been reported by Mt. Lyell Mining Co. New orebody adjoins the old North Lyell and Crown Lyell workings. Mt. Lyell Mining Co. lost about $200,000 last year on its mining operations because of the drop in copper prices and its continued mining activities will depend on government's assistance.

A part of Australian production of zinc concentrates in 1957 is likely to be stockpiled while prices remain at what the Australians consider to be a depressed level. The estimated output of zinc concentrates in 1957 should be between 270,000 and 280,000 tons while the official refined zinc production estimate for 1957 is 105,000 tons.

Stanleigh Uranium Mining Corp. of Toronto and New York has concluded an agreement with Australasian Oil Exploration Ltd. to operate jointly the Anderson's uranium lode in the Cloncurry-Mt. Isa district of Queensland. Joint efforts will be made to increase the proven tonnage of Anderson's lode and to solve certain important metallurgical problems.

A further substantial increase in the Australian output of blue asbestos is confidently expected by informed Australian circles. It is pointed out that until very recently the bulk of local output was exported but that in the future a quantity of up to 4,000 tons annually may find local outlets. The overseas demand for the rising output of blue asbestos at Wittenoom Gorge, Western Australia is increasing.

United Uranium N.L. is treating more pitchblende ore for shipment to the U. S. Gold content of the pitchblende from the Palette mine is high and the gold is recovered by amalgamation. Part of the accumulation of tailings assaying more than 14 lb uranium oxide a ton was sold to the Australian AEC plant at Rum Jungle. The same company is testing, by trenching, a silver-lead deposit at Bamboo Creek, about 17 miles east of El Sharana.

Large program of development is under way at Central Norseman Gold Corp. N.L. Major objectives of the development plant include prospecting of the Crown reef southward, the Mararoa shear northward and in depth and the Princess Royal shear in depth both north and south of the present shaft.

A 36% rise in gold output has helped

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GARDNER-DENVER R68

New drilling speed
New ease of operation

Here's a new stoper with added automatic features that increase drilling speed and handling ease. The new R68 has all of the rugged strength, operational efficiency and top manufacturing qualities of all other widely used G-D stopers—another example of Gardner-Denver engineering foresight.

New R68 features:

1. Gardner-Denver automatic water control—operating on the "water on—air on; air off—water off" cycle.
2. Push-button or rotary type feed controls.
3. Equipped with automatic blowing through chuck end—keeps mud and abrasive cuttings out of drill.
4. Is available with collared or tappet chuck. Your choice of direct or telescopic feed.

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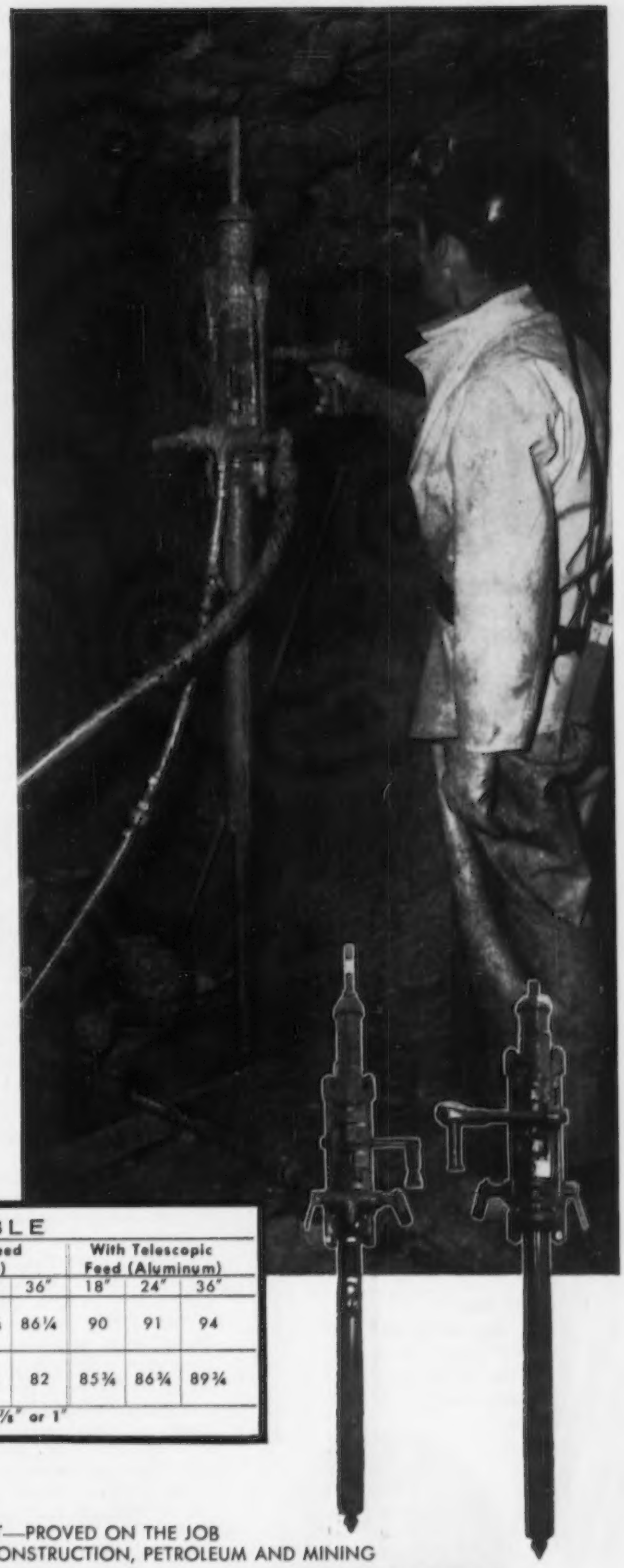

SPECIFICATION TABLE

Model R68	With Direct Feed (Steel)				With Direct Feed (Aluminum)				With Telescopic Feed (Aluminum)		
Steel Change	18″	24″	30″	36″	18″	24″	30″	36″	18″	24″	36″
Weight: (With Tappet Chuck) lb.	94	97	100	103	80¼	82¼	84¼	86¼	90	91	94
Weight: (With Collared Chuck) lb.	89¾	92¾	95¾	98¾	76	78	80	82	85¾	86¾	89¾
Steel Sizes: Hex or Q.O.—⅞″ or 1″											

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Our engineering staff will promptly assist you in solving your screening problems. Be sure to include specifications.

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Australia *(Continued)*

Wattle Gully Gold Mines N.L. to almost double its net earnings in the fiscal year ended June 30. Profit rose from £A43,041 to £A83,049. Ore treated rose from 45,054 to 57,067 tons for a recovery of 21,176(prev. 15,620) oz. Proved and probable ore reserves rose from 150,000 tons to 175,000 tons with an estimated 7.5(6.7) mining grade. Production in the last fiscal year was limited by the capacity of the battery treatment plant and the company is considering an increase in treatment capacity.

Uranium deposits may have been discovered in the vicinity of Tennant Creek, Northern Territory, as a result of a recent widespread aerial geophysical survey.

An area of over 2,000 sq miles had been surveyed and a series of maps will be released to the public, the first of which appeared last month.

Western Mining Corp. Ltd. will continue its efforts to establish Great Western Consolidated N.L. on a sound basis but it is also giving more attention to metals other than gold. A preliminary geological examination has just been completed of the Mt. Marion lithium-bearing pegmatites, a copper prospect has been tested jointly with other companies at Ravensthorpe and other prospecting is taking place in Western Australia.

Australian authorities have just approved six applications for nickel prospecting permits in an area of over 5,000 sq miles in the Papuan highlands.

Bulolo Gold Dredging Co., a member of the Placer group, is to receive authority for an area close to 2,000 sq miles.

South Australian Government has announced that further significant uranium finds have been made on the Radium Hill field and that the life of the field has been considerably increased.

In addition to a new lode running parallel and south of the main lode, the latest discovery was ore which occurred in the rock itself. This was at shallow depth and could be quarried for a start.

Mineral sands producers from the States of New South Wales and Queensland have formed the Australian Association of Mineral Sands Producers to deal with matters affecting the industry as a whole.

D. G. Cummins of Associated Minerals Consolidated Ltd. has been elected president and L. W. Doggett of Brisbane, Queensland has been appointed secretary.

Australasian Bureau of McGraw-Hill World News understands that the new association will be used in an attempt to lift up the prices of mineral beach sands and particularly rutile. The absence of large-scale purchasers is continuing to worry the Australian producers who will have their government's support in attemps to obtain better prices for their output through controlled disposal of stocks.

On the other hand it is doubtful whether these attempts would be adequate to obtain anything but a very small increase in ruling prices. Refusal of purchasers to sign longer-term contracts appears to influence the market.

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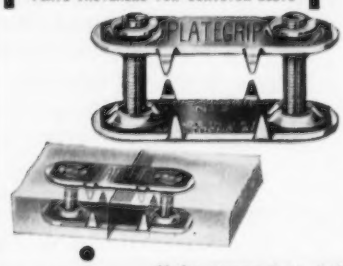
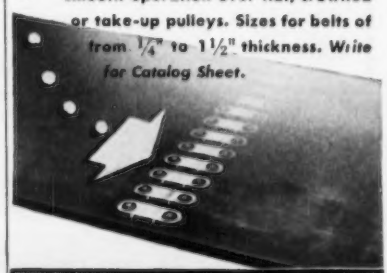


- Make strong dust-tight, water-tight joints in belts of any width. Special design spreads tension uniformly across belt, allow natural troughing of belt and assures smooth operation over flat, crowned or take-up pulleys. Sizes for belts of from ¼" to 1½" thickness. *Write for Catalog Sheet.*



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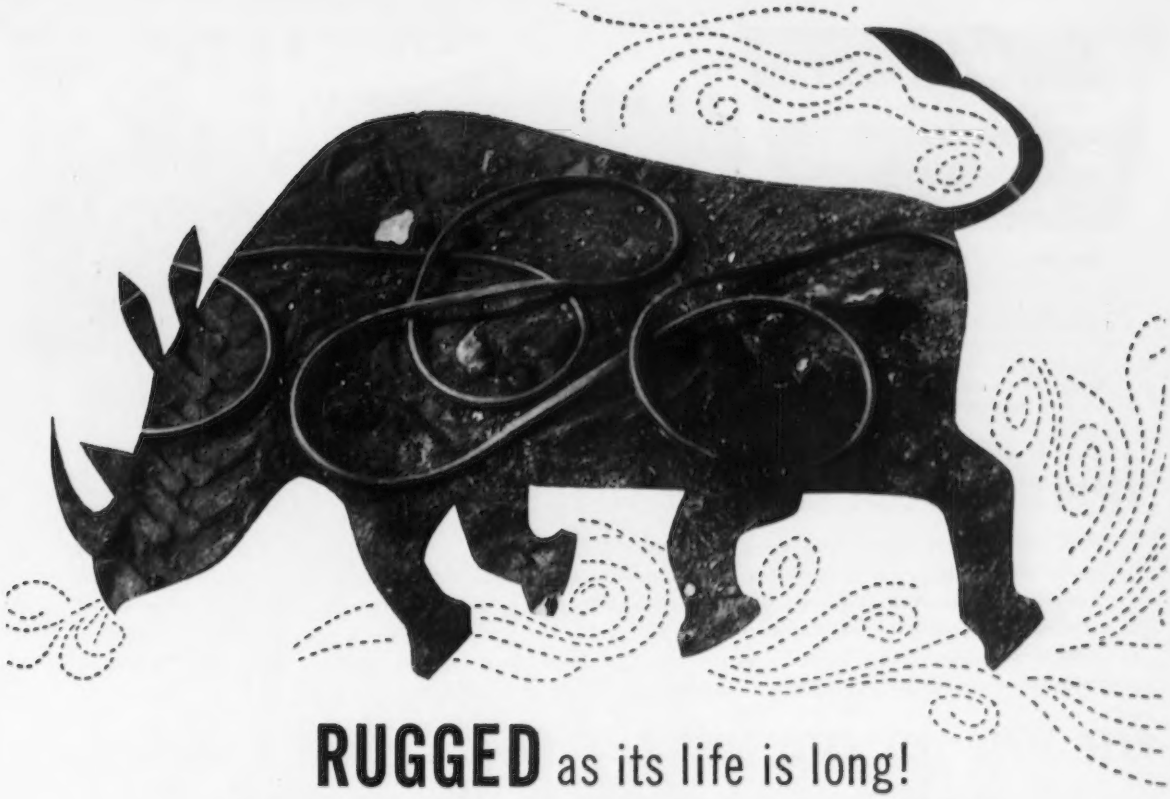

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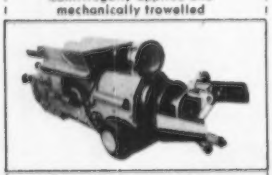

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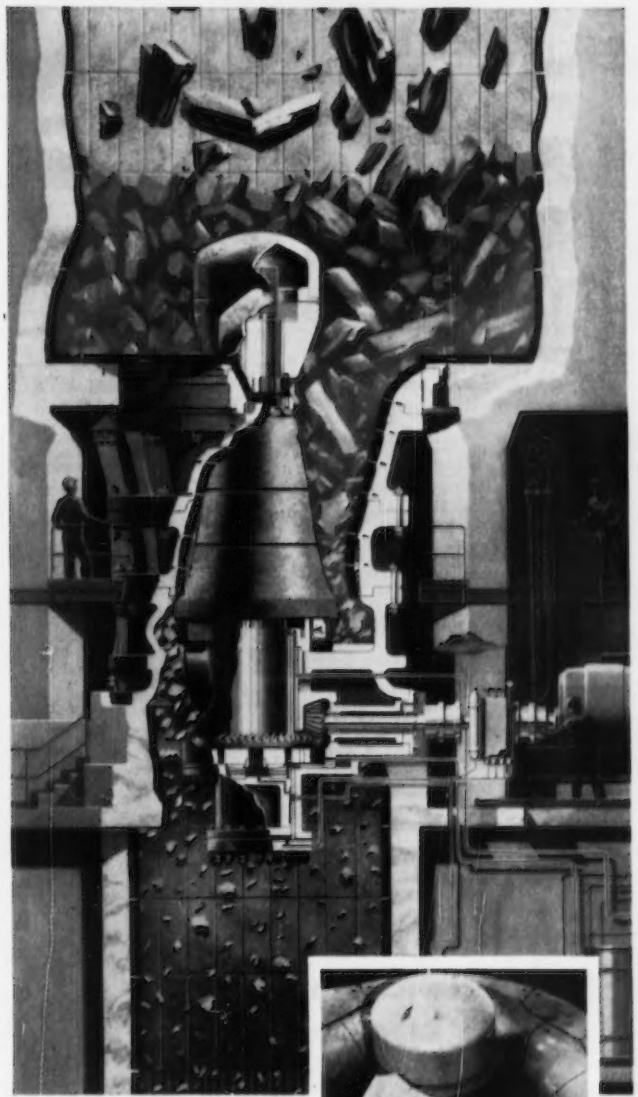

Illustration above by courtesy of Socony Mobil Oil Co., Inc.

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Mantle and concaves (shaded portions) in this rock-crushing giant are cast of Amsco Manganese Steel. Mantle weighs approximately 40,000 lbs.—the concaves, or side plates, approximately 71,000 lbs.

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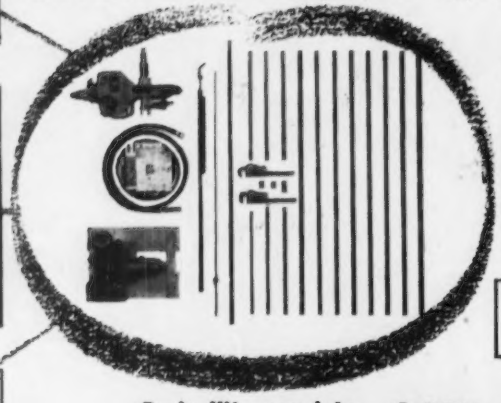

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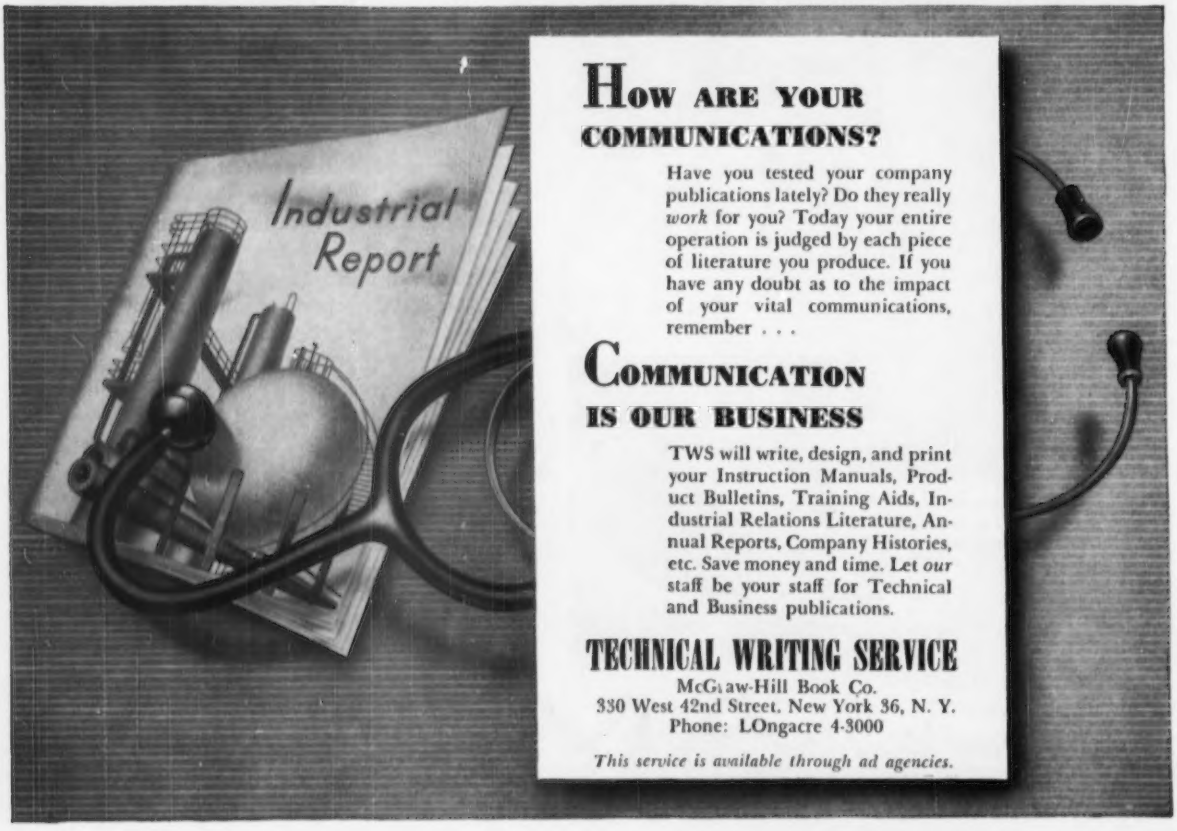

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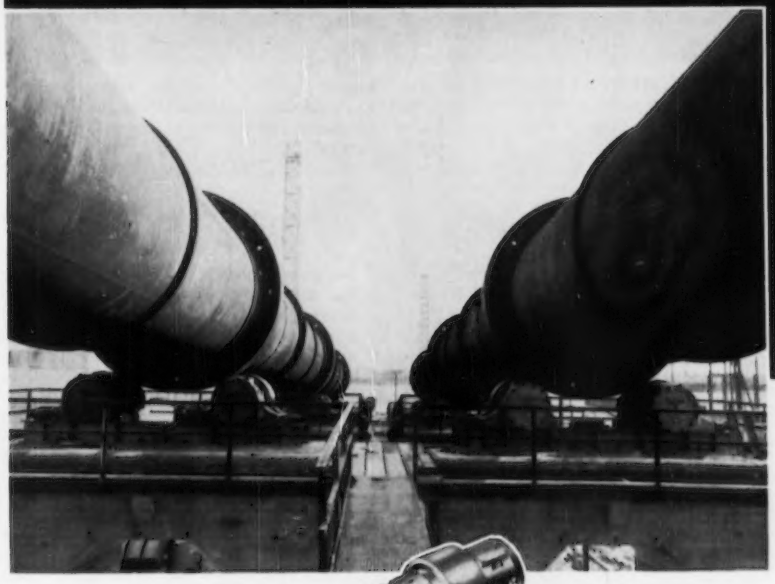

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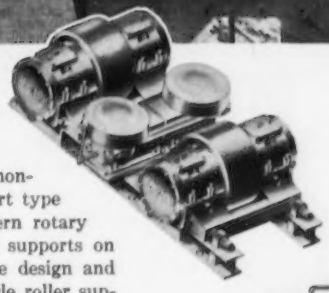

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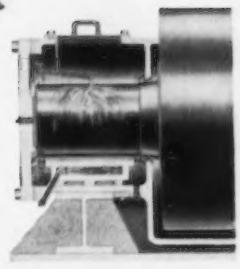

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IN THE PHILIPPINES

Sipalay Copper mine in Negros is now producing at rated mill capacity of 4000 tpd. Ore is low grade disseminated chalcocite, averaging less than 1% copper with a little gold.

Surigao Consolidated has been conducting an active prospecting program in many parts of the Philippines. Special attention has been paid to Negros, where three copper prospects have been drilled under the direction of Nestorio N. Lim. Grade of ore is generally less than 1%.

Surigao is also investigating an iron property in the interior. Tonnage appears adequate but transportation will be difficult.

Atlas Consolidated continues to set new production records at its Toledo mine in Cebu. In August 378,657 tons were milled, averaging 0.65% copper, from which 4,210,292 lb copper were recovered in 8272 tons of 25.4% copper concentrates. Shipments for the month totalled 7,111 tons of concentrates. Including value of iron ore shipped from the Mati mine in Davao, value of shipments was $1,085,000.

Benguet Exploration Co. will begin operations at its new 50-ton mill at Baguio in September. Company claims a high grade of ore, said to average about 1 oz gold per ton in spite of its refractory character. Benguet is operated by Philex Mining Corp., which is also bringing its Palawan chromite property into production, with first shipment expected late in September.

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IN ASIA

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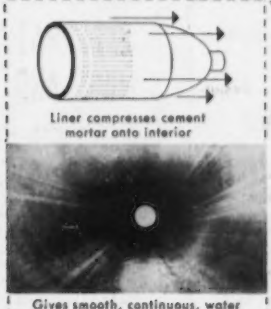

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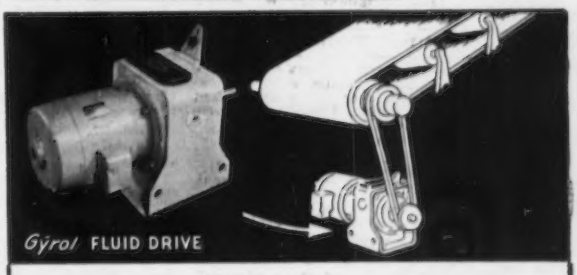

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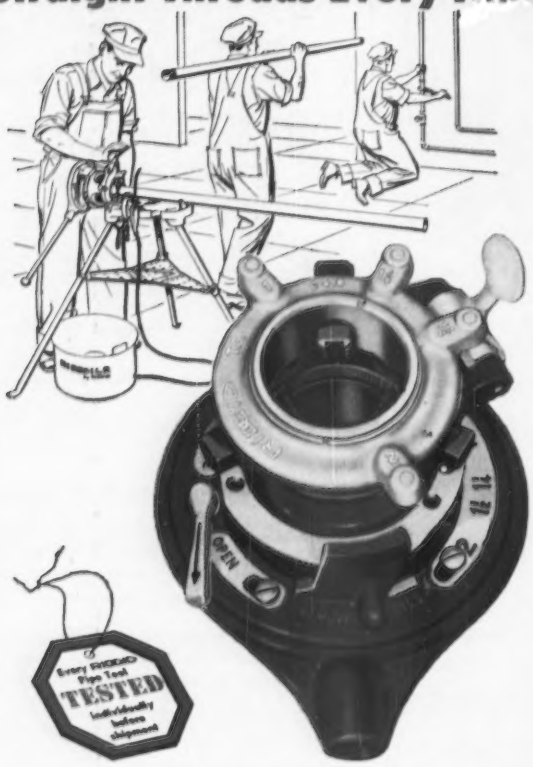

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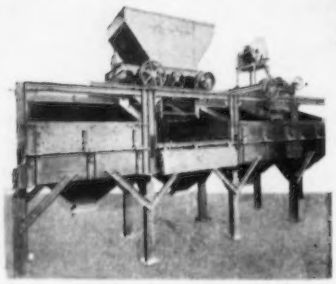

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A MESSAGE TO AMERICAN INDUSTRY • ONE OF A SPECIAL SERIES

BASIC RESEARCH . . .
More Practical Than You Think

This editorial, one of a special series on the importance of research to the American economy, deals with an aspect of our research program that may have serious consequences in future years — the lag in basic research.

An earlier editorial in this series noted: "The keen interest of U. S. business firms in scientific research points the way to a new kind of prosperity for our economy — a prosperity based on deliberate creativeness." As a result of the dramatic increase in industry's research expenditures, more new products will be introduced in the years 1957-1960 than in any previous four-year period.

A steady stream of new products and new processes means better values for consumers and lower costs for business. And thus it promises to sustain a high level of general prosperity that defies the old laws of boom and bust. **But, as we look further ahead, there is a danger that the stream of research discoveries may run dry because of our neglect of basic research.**

This danger was described by John Jay Hopkins, late founder and chairman of the General Dynamics Corporation: "Unless there is a revolutionary development in America of pure, not applied, science, there will come a day when there is no use in trading in your old car; because the new one is no better. The only difference between this year's television set and next year's will be the appearance of the cabinet! Scientific progress will be replaced by scientific stagnation."

What Basic Research Is

Basic (or pure) research has been characterized as the pursuit of knowledge for its own sake rather than to fulfill some practical objective. It is generally carried out in an environment which allows the investigator the freedom to follow the lead of his curiosity. The scientist in basic research, in the words of Glenn T. Seaborg of the University of California, is not concerned with "utilitarian goals, but a search for deeper understanding of the universe and the living and inorganic phenomena within it."

Impractical as basic research may seem in its initial purpose, it is an essential prerequisite to applied research and product development. A few examples will show how some of the greatest technical advances of recent years have come from basic research projects that had no immediate practical objective:

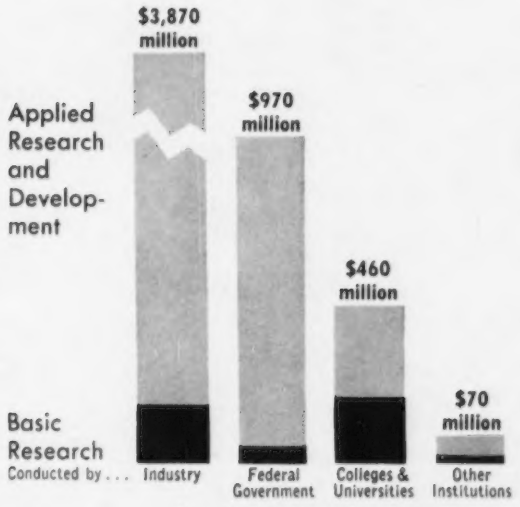
- **Radar** — an important military development of World War II with broadening commercial applications — was the outgrowth of a basic research project whose purpose was to obtain information about the height of the ionosphere, the layer of air that lies some 25 miles above the earth's surface.

- **Transistors** — the miniature devices which are already vital components of hearing aids, pocket radios and a wide variety of industrial equipment — were invented at Bell Laboratories (research subsidiary of the American Telegraph and Telephone Company) following university investigations into the electrical behavior of solids.

- **Neoprene** — a synthetic rubber — was developed by duPont with the help of basic information provided by Father Nieuwland of Notre Dame, who discovered he could control the polymerization (the linking together of molecules) of a certain class of organic compounds.

- **Nylon** — the first of the noncellulosic synthetic fibers that have revolutionized the textile industry — grew out of fundamental research by Dr. Wallace Carothers on long-chain polymers.

Only 8% of All Research and Development in the U. S. is Devoted to Basic Research



Data: National Science Foundation, "Funds for Basic Research in the United States, 1953"

Industry's Stake in Basic Research

Industry traditionally has relied upon colleges and universities and other nonprofit institutions for basic research; and the U. S. has long benefited from the greater emphasis placed on basic research in Europe. It is conventional to think that business cannot, and should not, do much about "ivory tower" projects which do not have immediate practical application.

However, there is not so much in this idea as is supposed. The examples above illustrate what Caryl Haskins, president of the Carnegie Institution, has called "the widespread paradox that the most important practical consequences are commonly the least sought after." Furthermore, it is certain that, without adequate basic research, industry's efforts to produce new and better products will become progressively more difficult. And our national defense, in an age of breathtaking military applications of science, will become increasingly precarious.

In the past, our economic growth came largely through expansion into new lands or through discovery and development of rich deposits of natural resources. Such opportunities are relatively limited today. The great opportunities now lie in discovering new materials and new properties of the materials we already have. **This is the job of basic research, and industry has a vital stake in it.**

The chart indicates the tiny share of research efforts in the U.S. that is devoted to basic research. **Only 4% of all research by industry, and only 8% of all research in the U.S., during the year 1953** (the latest for which information is available) **represented fundamental research to add to overall scientific knowledge.** Even in colleges and universities less than half the research performed is basic research. At least one Nobel Prize winner has expressed the belief that we need and should work toward a doubling of the proportion of our total research effort that is devoted to basic research as soon as possible.

What Business Can Do

Without anything like a staggering increase in the total cost of its research programs, industry could do much to expand our basic research effort. Companies with big research programs should, as a matter of successful survival, be devoting a share of the effort in their own laboratories to basic research. Significantly, companies that are already doing a notable job of basic research have also made an outstanding record of translating such research into new products for industry and the consumer.

Smaller companies may rightly regard the conduct of research projects with uncertain prospects of reward as a luxury. Some basic research, indeed, never results in any tangible payoff. But, with modest contributions, small companies can still have a part in the advance of basic research. They can join together with other companies on cooperative projects. They can support basic research through trade associations and technical societies. They can help research centers in universities and other nonprofit institutions. Arrangements are available in some instances whereby business firms can pay a fee to have access to work done by university researchers.

One way or another, it is up to private business firms to see that basic research moves forward. By doing so they will be laying the groundwork for the development of the new products and technology on which their growth, and the growth of the economy, depend.

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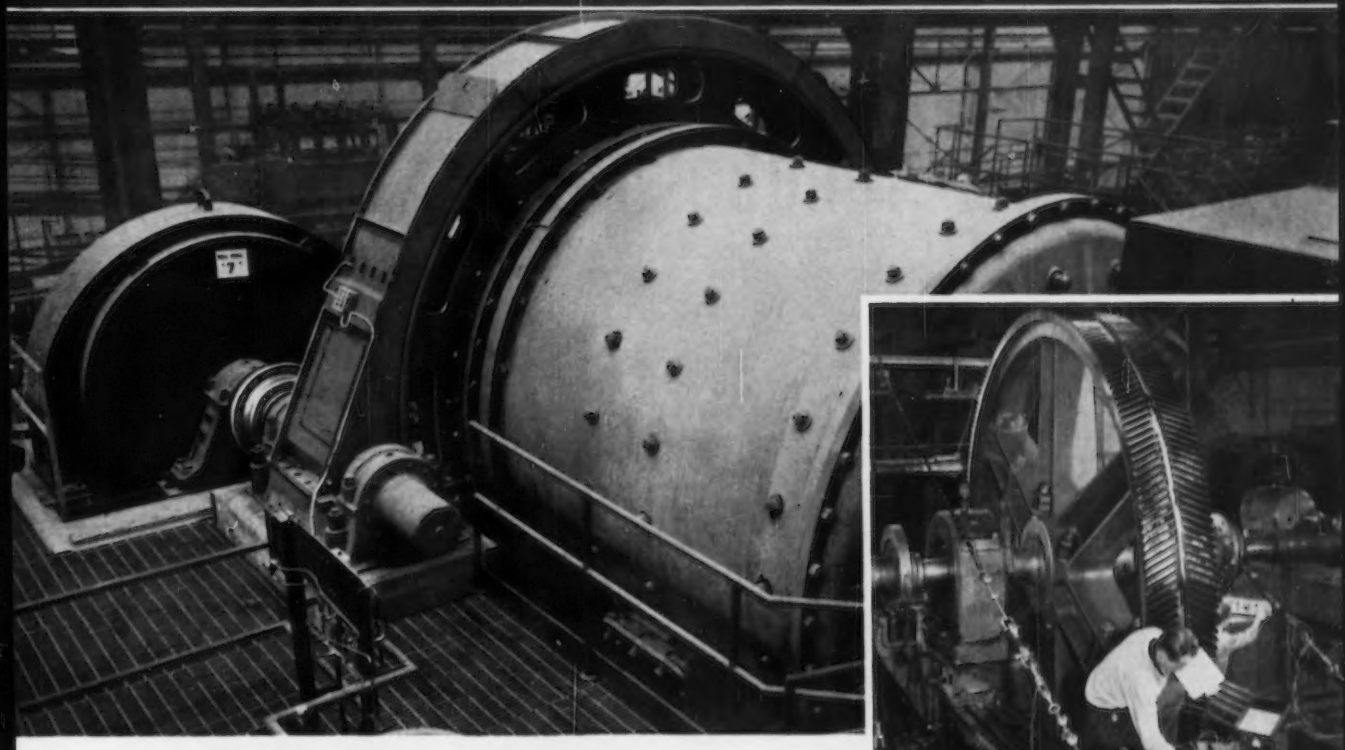

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Easy Way To Pick Up Important Savings

Picking out the best of these beauties is an easy way for us to save money—for you. For these are the finest industrial diamonds the world produces and they will do things for you that no lesser quality can do.

They cut faster, cut more footage per bit and per carat, yield more salvage and deliver more footage per man-hour and per dollar of rig investment. And, you can easily check this by comparing costs. The lower price tags on the lesser qualities can be a temptation, of course, but it's not the first but the final cost that counts.

The diamonds in Truco bits are painstakingly graded from the largest fine quality stocks on the American Continent.

Any Truco bit can prove to you that there is no substitute for quality.

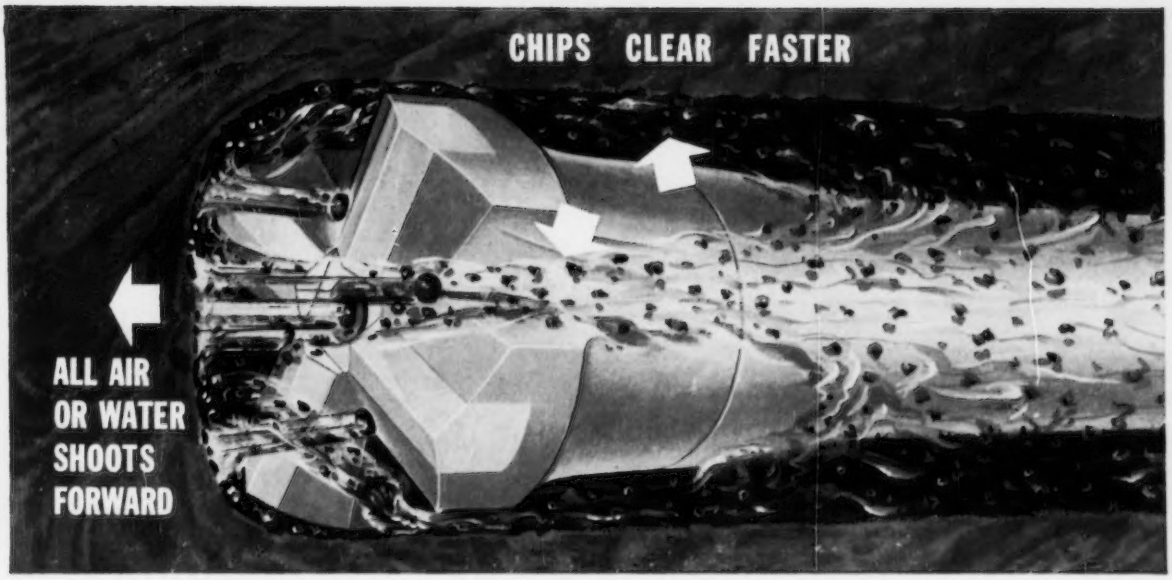
TRUCO DIAMOND BITS

by

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue, Detroit 38, Michigan

WHEEL TRUEING TOOL CO. OF CANADA, LTD.
575 Langlois Avenue, Windsor, Ont., Canada



New TIMKEN® threaded bit speeds chip clearance on drifters, sinkers and stopers

THREE NEW FEATURES help you get more hole-per-bit with the new Timken threaded bit. 1) new five front holes and 2) wider wing clearance speed chip removal; and 3) new wear-resistant carbides give longer bit life.

The picture above shows how you can increase your hole-per-bit average on drifters, sinkers and stopers. The new Timken® threaded carbide bit clears chips faster. That's because 1) newly-positioned five front holes shoot air or water *directly* against the rock face; and 2) deeper, wider wing clearance lets chips wash back faster. Deeper relief under the heel provides an even freer passage. As a result, the bit spends less time "drilling" chips, more time drilling rock. Removing chips this faster way eliminates the problem of clogged drill steels, prevents damage to bit skirts.

And the new Timken threaded bit has new special analysis carbides that give increased resistance to wear and shock. They can be reconditioned many times. Redesigned, heavier wing helps speed drilling. And improved thread contact reduces breakage to a minimum.

To get more hole-per-bit, use the new Timken threaded carbide bit. For more details, send for free brochure. The Timken Roller Bearing Company, Rock Bit Division, Canton 6, O. Cable: "TIMROSCO".

FOR OTHER TOUGH DRILLING JOBS

IMPROVED TIMKEN MULTI-USE BIT

With correct, controlled reconditioning, gives lowest cost per foot-of-hole when full increments of steel are used.

NEW TIMKEN TAPERED SOCKET BIT

For air-leg drills. Removable for full steel life. Tapered for more secure union. Same new frontal features as threaded bit.

TIMKEN REMOVABLE ROCK BITS

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See the next Timken Televent hour, "The Innocent Years" over NBC-TV, Thursday night, November 21st.